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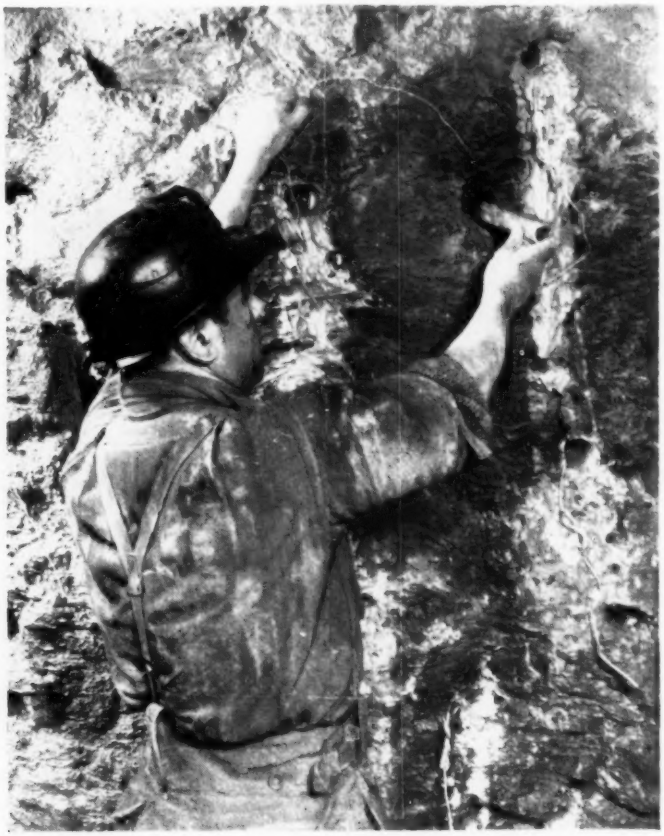

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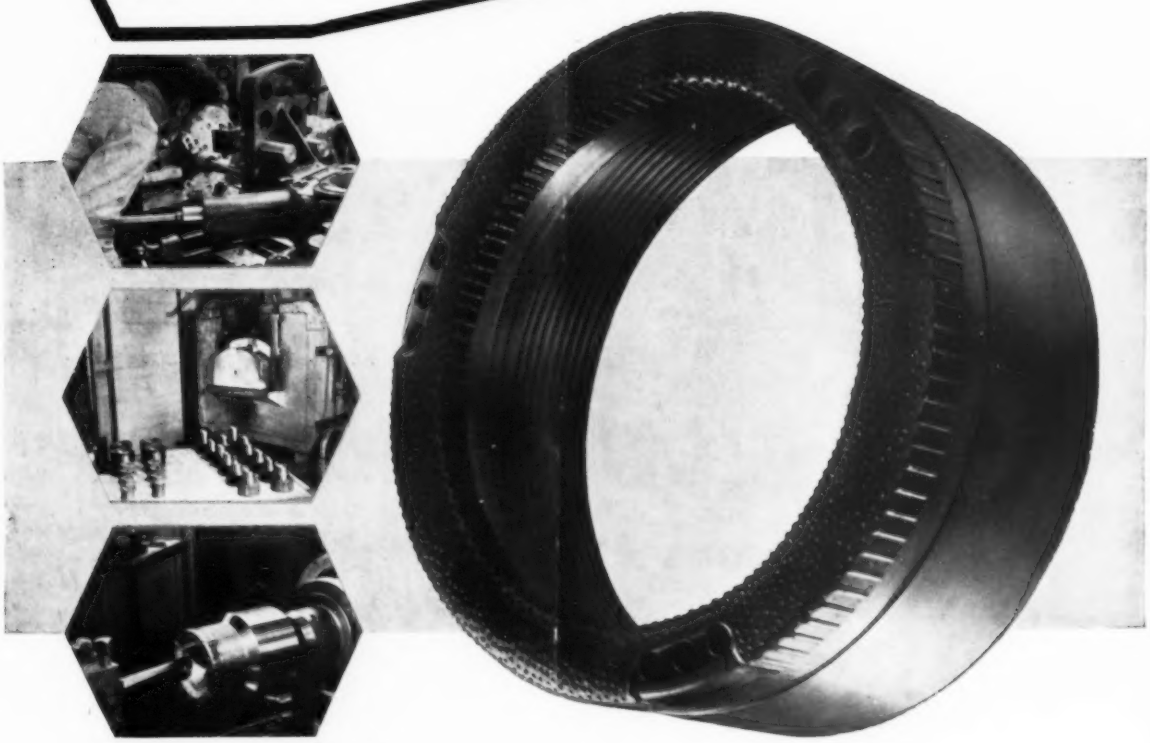

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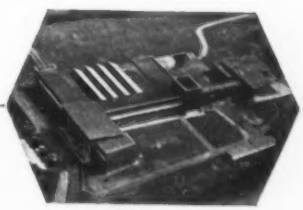

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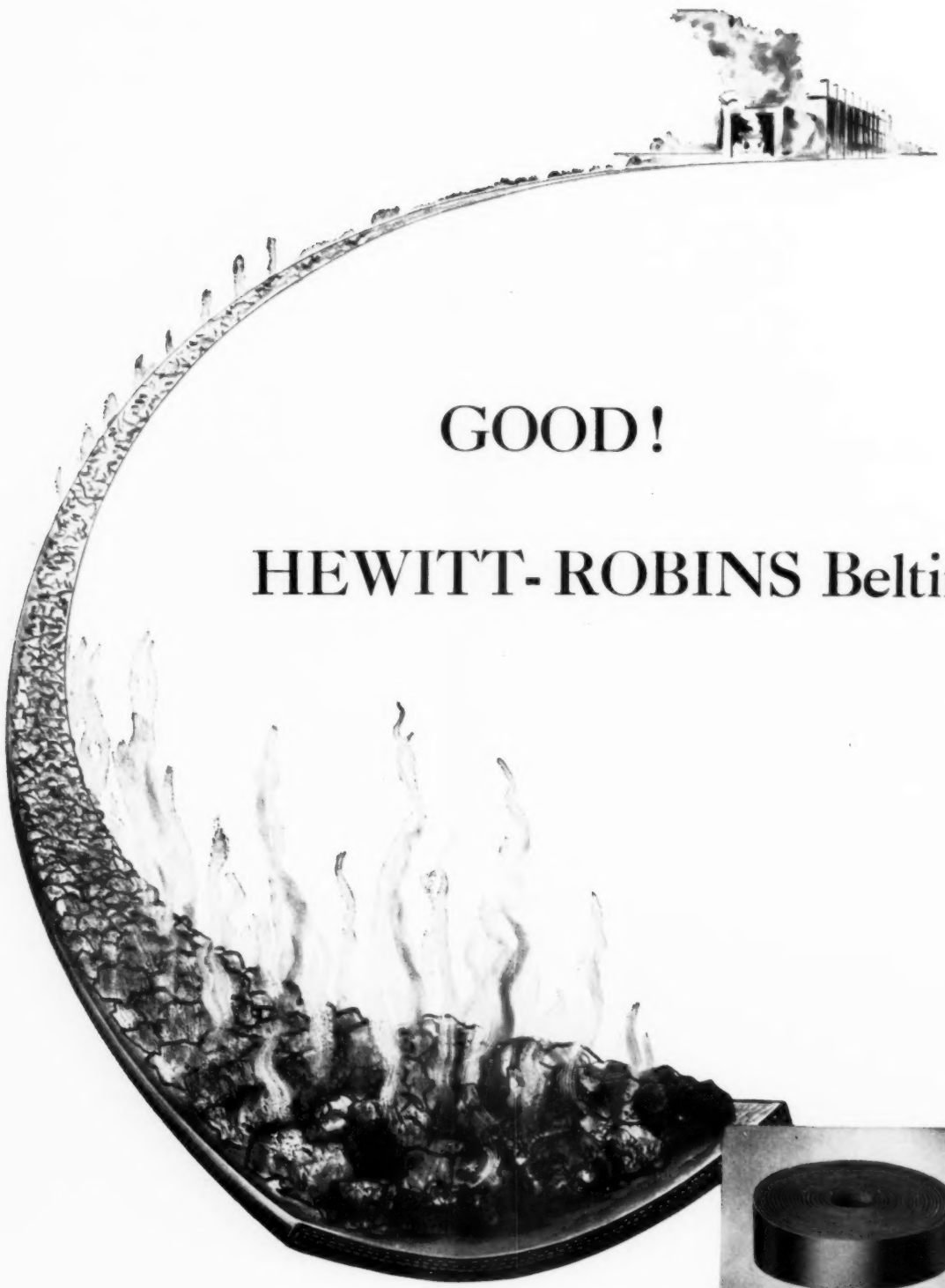

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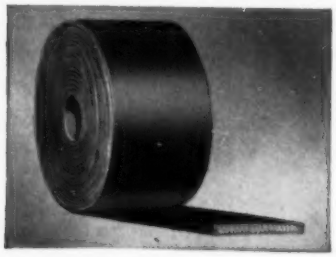

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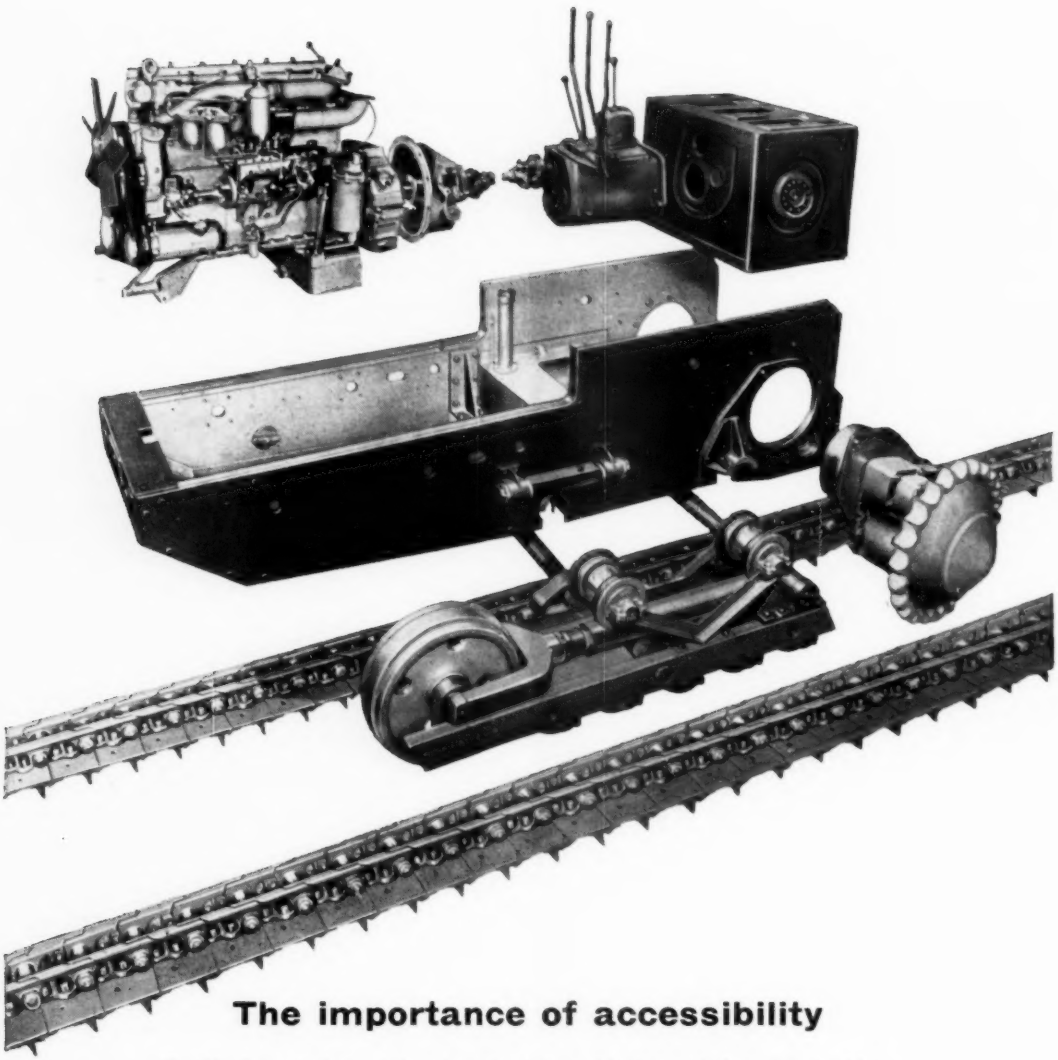

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The Anglo-French Exploration Company Limited; Central Mining — Rand Mines Group

*Published by The Mining Journal Ltd., at 15 Wilson Street, Moorgate, London, E.C.2. MONarch 2567 Subscription £2 5s. per annum*

# NOTES AND COMMENTS

### The Texas Smelter

Contrary to reports quoted here last week (page 398), it now appears, according to latest news from the States, that the Texas smelter is to be granted a further, if limited, lease of life. The Inter-Departmental Committee report, which last week was awaiting the President's approval, has now been accepted by him and forwarded to Congress. It is understood to state that while it would still be desirable to sell the smelter to private industry by June 30 next, yet the complexity of the transaction may require an extension of the deadline to January 31, 1957. With the Presidential election due next November, it is thus virtually certain that the smelter *will* run until next January, and it is impossible to escape the conclusion that the decision to let it do so will have been taken solely on the grounds of domestic political expediency. We pointed out last week that Senator Lyndon Johnson, of Texas, who is the majority leader in the Senate, has been a consistent opponent of the closing down of the smelter and the Administration has presumably hesitated to antagonize him at this stage in the electoral game.

While the decision is understandable in these terms, it provides little consolation for those who are hoping to see the International Tin Agreement come into operation in the near future. Nothing can happen on this front until Indonesia's ratification of the Agreement is complete and on past form we must assume that this further deferment of the closure of the Texas smelter will only provide that country with further encouragement to procrastinate.

The only further development in the situation, which might alter this prospect, would be a decision in Washington to cease stockpiling while continuing to operate the smelter. We have frequently had occasion to point out that the issues of whether or not to continue stockpiling and whether or not to continue government operation of the smelter are separate and distinct. Theoretically it should be perfectly feasible to continue operating the smelter while selling the output to American industry. Moreover, this would appear quite a logical move in view of the recent statement that long-term stockpile requirements of tin are expected to be completed by June 30 next. It would, indeed, be no bad thing if the smelter were compelled to operate on a normal commercial basis for a while, as this would bring home to all concerned more forcibly than in any other way the uneconomic nature of the present Longhorn set-up.

### Research and the Mining Industry

It is a far cry from the time when high-grade deposits were available in abundance on or near the surface of the ground to satisfy man's requirements for metals and minerals. With the progressive exhaustion of the richer and more accessible occurrences, it has become necessary to search for and develop deposits which, because of their low grade or remote situation, would formerly have been regarded as commercially valueless, and also to penetrate more deeply into the earth's crust. In these exacting conditions the mining industry has become critically dependent on research not only to overcome the formidable technical problems with which it is being increasingly confronted, but also to preserve the exiguous margins of profit on which most undertakings are nowadays compelled to operate.

A striking indication of the wide field covered by research within the mining industry itself is afforded by the work of the Mining Research Establishment of the National Coal Board at Isleworth, Middlesex, which will be reviewed in forthcoming issues of *The Mining Journal*. It should not be forgotten, however, that mining technology is also benefiting from research activities in other branches of industry and engineering. In fact, there is hardly any field of research which does not impinge in some form or another on mining. The National Coal Board, for example, is utilizing the recently developed germanium transistors in designing compact and efficient instruments for use on the surface and underground. Even such an apparently unrelated avenue of research as work on food processing and preservation may have an important bearing on the catering problems of mining companies, particularly those operating in inaccessible regions.

Of considerable interest to the industry, therefore, is the report of the Department of Scientific and Industrial Research for 1954-55. The Department has some twenty research stations and its report also covers the activities of nearly fifty industrial research associations and other grant-

aided organizations. In addition, the D.S.I.R. takes part in a number of co-operative research activities through such international bodies as O.E.E.C. and the European Organization for Nuclear Research (C.E.R.N.), while its officers attend numerous conferences at home and overseas. It is thus in the forefront of world research.

The latest D.S.I.R. report summarizes recent progress in a number of projects which have been reviewed in this journal from time to time, among them being the desalting of brackish waters, the recovery of germanium from coal, the Geological Survey programme of boring, the work of the National Physical Laboratory on titanium alloys, that of the Chemical Research Laboratory on the determination of soils, and the development of a successful coal pump by the British Hydromechanics Research Association. There should also be much of practical interest to mining executives and engineers in many of the other investigations covered in the report, such as model tests of pumps and diffusers at the Mechanical Research Laboratory or the study of circuit interruption by the British Electrical and Allied Industries Research Association.

The report contains details of the working of the first financial year of the Department's five-year plan, announced at the end of 1954. The estimates for the year 1955-56 show the steady expansion of the D.S.I.R. programme. Net expenditure is expected to be about £6,500,000 in that year compared to £6,250,000 in 1954-55. Increase in staff totalled only 159, although provision had been made for an annual net rate of 200. The Advisory Council believes that the major causes of the shortfall are the increasing demand for scientific and technical staffs and their scarcity. The dearth of scientific workers is, of course, by no means confined to the U.K., but is a problem which is becoming increasingly acute throughout the free world. Difficulties in competing in remuneration with other forms of employment are doubtless responsible to some extent for the shortage, but the ultimate solution to the problem can only be found by providing a more adequate flow of trained research workers. Within the limits of available funds, the Department is helping to achieve this aim by granting maintenance allowances to post-graduate students for training in science and technology. These are being awarded at the rate of about 400 a year and are normally held for two or three years, so that the number current at any time is about 1,000.

**New Problems for Metallurgists**

The first conference to deal solely with reactive metals was held at Buffalo from March 19 - 21 by the American Institute of Mining, Metallurgical and Petroleum Engineers. It consisted of technical sessions lasting two days, followed by visits to the Cornell Aeronautical Laboratory in Buffalo and the Metals Research Laboratories of Electro Metallurgical Company at Niagara Falls. Associated with it was an exhibition of titanium, columbium, zirconium and other reactive metals by reactive metals producers, boride and mill product manufacturers, and optical laboratory equipment makers.

This event might well be the forerunner of reactive metals conferences held at regular intervals in the U.S., the U.K. and elsewhere. The papers presented are an impressive indication of the progress already achieved by metallurgists in carrying out their formidable task of developing new materials for new applications whose requirements as yet are relatively little known.

Nuclear reactors make exacting demands on metals, while radioactivity has curious effects on metallic fuels and components. Rear Admiral H. G. Rickover, of *Nautilus* fame, regards the metallurgical problems as falling into two main categories. First there are those unique to atomic energy—fuel elements and other reactor components that use uranium, zirconium or beryllium and must withstand the impact of the nuclear fission process. Second are problems associated with conventional materials.

Nuclear reactors are basically similar to the furnaces used in coal-fired power plant in that they must produce heat efficiently and provide for the transfer of that heat into electrical energy. On the other hand, they involve high heat flux, corrosion, neutron economy and radiation factors, that are not encountered in carbon-fuel plants. These nuclear factors impose strict limitations on the materials that can be used. To the familiar problems of using materials at high temperatures and pressure must be added new ones caused by the fact that nuclear fission heat is generated inside the fuel element and proceeds outwards, whereas in chemical combustion heat is applied from outside and proceeds inwards.

V. P. Calkins, of General Electric Company's nuclear propulsion department, classifies the metallurgical problems into four main categories: (1) There are physical and mechanical problems due to internal heat generation. Heat liberated inside a fuel must be able to pass to the coolant or the system will simply melt and vaporize. (2) Nuclear properties of reactor materials must not interfere with the fission process. The fuel must capture neutrons and efficiently use them; the moderator must slow them down. Other structural materials must have as little effect on neutrons as possible. (3) In addition to the normal problems familiar to industry, corrosion in a reactor poses a new and formidable consideration. Corrosion of sheathing around fuel elements, for instance, would release radioactive materials to contaminate the whole system and endanger operating staff. (4) Radiation damage is done to both metallic and non-metallic materials when gamma radiation or fast neutrons change the arrangement of atoms in the lattice of solid material.

Corrosion problems are related to the heat factor. Aluminium, which is widely used in research reactors at comparatively low temperatures, would be useless in a pure state for high temperature power reactors. It corrodes in water above 160 deg. F. Beryllium, on the other hand, is highly resistant to corrosion and has a high melting point. It also has one of the lowest capture cross-sections for thermal neutrons. That is, it intercepts few of the neutrons needed for fission in the fuel. But beryllium costs $175 a lb. and aluminium 25 c. a lb.

So far zirconium at $30 a lb. has proved the most promising metal for use in reactor components. It resists corrosion in water up to about 480 deg. F.; it absorbs very few thermal neutrons and it has a melting point above 3,300 deg. F. It does have certain corrosion qualities, which have been overcome in alloy form. Similar alloy possibilities are being investigated for aluminium. Most reactor components, in fact, involve elements of exceptional purity and alloy combinations.

The metals situation has been concisely summarized by J. C. Horsman, of Atomic Energy of Canada's nuclear engineering branch. Where neutron economy is essential we have three metals—zirconium, beryllium and aluminium. For high temperature operation and low neutron loss we are limited to zirconium and beryllium. If neutron economy is not of primary importance, the available metals are stainless steel, molybdenum, titanium and nickel.

These are by no means the only types of problems with which metallurgists are now confronted. For example, L. G. Cook, of Atomic Energy of Canada, in a paper presented to the American Institute of Mechanical Engineers, pointed out that uranium reactors fulfil some of the dreams of the alchemists, in that all materials in a reactor are transmuted and some at considerable rates. Aluminium is con-

verted to silicon. In high power reactors gold is transmuted to mercury at from 10 to 40 per cent per annum—a phenomenon which might aptly be described as an alchemist's nightmare !

Then, too, there are problems associated with gas turbines, guided missiles and supersonic flight, which make further demands for materials with properties or combinations of properties capable of withstanding progressively more exacting conditions. In many instances the very properties which render them particularly suitable for a given application cause formidable production and processing difficulties.

A better understanding of the properties and behaviour of the so-called reactive metals is of prime importance to the newer fields of human endeavour such as nuclear power generation and supersonic flight. By bringing down production and fabricating costs, it should also lead to new applications for these materials in other fields where their unique properties might be of value.

# Australia

*(From Our Own Correspondent)*

Melbourne, March 31.

Equipment is to be pushed ahead rapidly at the Mary Kathleen mine, owned jointly by Rio Tinto Ltd. and Australasian Oil Exploration Ltd. The sum of £A10,000,000 will ultimately be spent on the work, completion of which is expected in 1959. A town will be built immediately, of 200 houses; these will be pre-fabricated. A dam will be constructed on the Corella River, eight miles from the mine, and will contain three years' supply of water or 3,500,000,000 gal. In the testing work on the deposit, 30,000 ft. of diamond drilling has been carried out, and over £A300,000 has already been spent on the project.

Transport is a difficult problem. The mine is situated mid-way between the towns of Mount Isa and Cloncurry and the connecting road is bad. Rail communication is with the port of Townsville, 600 miles away, but the railway is barely equal to the requirements of Mount Isa so the immediate outlook is difficult. The Mary Kathleen Uranium enterprise will be a very important addition to Queensland mining.

In the Northern Territory, the ultimate position of uranium mining is rather obscure. The big enterprise is the Zinc Corporation-operated, Government-owned, Rum Jungle mine, which is now receiving ore from outside producers. Several private enterprises have carried out vigorous prospecting, and there has been serious talk of the erection of a treatment plant to serve these companies. There is, however, a strong element of doubt as to whether the combined ore reserves, as so far known, are sufficient to justify the heavy expenditure involved in the establishment of a plant. The immediate problem will be that of the deferment of the plant project pending further development, and the delivery of ore to Rum Jungle at such rate as can be received at the mill. So far as can be ascertained, high grade ore has been proved at a number of points, but the question is that of continuation from point to point.

## LATENT POTENTIALS OF MICA

Australia has important deposits of mica of high grade, but they are not being worked on the scale of which they are capable. The Hart's Range field, north-east of Alice Springs, Northern Territory, is amongst the largest in the world, and the occurences contain a high proportion of material that can be cut to large commercial sizes. Yet Australian production is only about 30 tons per year. Factors limiting the productive capacity of the field are its isolation, though in this respect it is little, if any worse, than some of the gold and wolfram fields; high production costs have a considerable bearing because of distance from markets, the buying centre, at which mica has been cut and graded, having been located in Melbourne.

The chief contributing cause to high costs is the haphazard method of mining and the general absence of systematic opening up of the mines to assist toward a reasonable cost of mining. In the past, mining has been carried on by small co-operative parties, and companies have been deterred by the high cost of labour and the difficulty in obtaining efficient supervisors and managers to ensure a high recovery and reduce damage in mining to a minimum. The extent and nature of the occurrences, and the proportion of books, together with the quality of the mica, make the Hart's Range and Plenty River fields worthy of much greater attention than they have received.

## INCREASING IMPORTANCE OF RUTILE

The production of rutile concentrate is rapidly increasing in importance. In the first nine months of 1955, output was 42,713 tons, compared with 31,126 tons in the corresponding period of 1954, and it is expected that production in 1956 will exceed 60,000 tons. The eastern coast, from Fraser Island in Queensland to Newcastle in New South Wales, is being examined and prospected, and it is expected that several new producers may come into operation in 1957. The beach sand industry depends directly upon the market for rutile; the market for zircon, which accompanies the rutile in more or less equal proportion, is very depressed, due to unavoidable over-production, and sales of this mineral are very restricted and the price low.

## DECREASE IN GOLD OUTPUT

Australian gold production for 1955 was 1,049,000 f.oz. which is slightly lower than the production in 1954, which, however, was the highest recorded for 12 years. Of the total production, 79.6 per cent came from Western Australia, the Northern Territory and Queensland each contributed 6.2 per cent and the other States combined produced eight per cent. The industry will continue to receive some assistance from the Commonwealth Government under the Gold Mining Assistance Act which has been extended for a further three years. Under the Act, a producer cannot claim assistance unless the value of gold produced is more than 50 per cent of the total value of the particular producer's output. Small operators are those who produce less than 500 oz. per year, and these are eligible for assistance at a flat rate of £1 10s. per oz.

The amount payable to large producers is based on quantity of fine gold contained in bullion produced during the year, and such producers are not eligible unless the individual average cost of production exceeds £A13 10s. per f.oz.; the amount then payable is calculated at three-quarters of the excess of average production cost during the year over £13 10s. per f.oz., subject to a maximum rate of £2 per oz., and provided that a producer's profit after payment of subsidy does not exceed 10 per cent of the capital used by the producer in the production and sale of the gold.

Western Australian mint returns for January and February give total production of gold for 1956 at 160,773 f.oz. which compares with 128,812 oz. for the first two months of 1955. This figure cannot be taken as a forecast of the year's trend, for in every year there is one exceptionally high month and February of this year, is much above normal.

*METALS EXTRACTION—I.*

# Extraction of Uranium and Vanadium

**The Institution of Mining and Metallurgy held a symposium on the extraction metallurgy of some of the less common metals on March 22 and 23, 1956. At this symposium a number of papers presented dealt with the recovery of what used to be known as the rare metals, but which now are classed as less common metals as a consequence of their increasing applications in industry and the development of improved exploration, mining and extraction techniques. The following article presents a résumé of those papers presented dealing specifically with uranium and vanadium, while a concluding instalment will discuss titanium, beryllium, thorium and niobium with special reference to Canadian developments in this field.**

While the majority of the less common metals find their ultimate application in the metallurgical field as alloying elements, or in the production of articles in which their special properties are advantageous, uranium comes within an entirely different category. With the development of nuclear research uranium has become a very important strategic material on which the life of a country may depend, while it may also be classed with coal and oil as a steam-raising material. Unlike coal and oil, which are basically crude chemicals from which a great variety of other chemicals may be produced, uranium is of relatively little value as a metallurgical material, or as a base for chemical manufacture. It follows that the almost frantic search for uranium is always associated with nuclear research, and processes are being developed to treat what have hitherto been most unpromising deposits in order to obtain uranium.

The day has not yet dawned when it is a crime to use coal or oil merely as a fuel, but no doubt such a day will arrive if the world's uranium sources can be harnessed. In such countries as Britain, where coal is obtained only under ever-increasing difficulties, while oil may be imported only as long as goodwill can be maintained in the oilfields, the importance of efficient processes for the extraction of uranium cannot be over-estimated.

## EXTRACTION OF URANIUM

The papers presented at the symposium included several on uranium extraction metallurgy, and these show that while initially it was the practice to apply orthodox physical methods of extraction to uranium ores, more recently chemical methods have proved more successful. The rapid and relatively successful chemical leaching treatments resulted in further experiments in this direction with neglect of physical methods. However, with the increase in types of ore discovered and due to the refractory nature of some important uranium-bearing constituents, it has become necessary to devise physical methods of concentration so that economical chemical treatment may be used later.

At the end of World War II only two types of deposits were considered as likely sources of uranium, the hydrothermal vein deposits and the carnotite ores. In the past few years about 24 types of deposits have been considered as worthy of treatment, and the host rocks may be igneous, sedimentary or metamorphic. Deposits are known to occur in several different rock types within each group. Up to the present time the most favourable igneous and metamorphic rocks appear to be felsic intrusives and arenaceous metasediments. It is now known that uranium occurs far more frequently in various parts of the world than was at one time considered possible. Deposits in sedimentaries are of world-wide distribution, with principal occurrences in sandstones, shales, conglomerates and marine phosphates. It follows that feeds for treatment plant vary according to the mineral that has to be handled.

In uranium-bearing minerals the degree of metamictization may have significant effects on the properties of the mineral, and this is a feature which is not generally of concern in the treatment of ores of other metals. As a result of transformation to the metamict state, through structural disruption by disintegration of radioactive atoms, decreases in density appear to be involved, accompanied by hydration and increases in volume; these changes being sufficient in many cases to shatter the minerals. Physical changes of this nature affect the mechanical strength of the mineral and hence its resistance to grinding.

With some lower grade uranium-bearing minerals the recovery of associated materials may prove essential to the economy of the operation, and the range of mineral species associated with uranium includes many which will have economic value when present in sufficient quantity. In vein deposits iron, copper, cobalt, lead, silver, nickel and bismuth occur, chiefly as sulphides; the abundance of these elements decreasing in the order given. Thus it is clear that any extensive exploitation of minerals for uranium recovery will involve the reclamation of other metals. In this way it will be possible to treat minerals of very low uranium content because the economics of the undertaking will be take care of by the extraction of other useful metals.

Minerals bearing uranium are seldom found in veins of any appreciable width, as are those of many of the commoner metals; the uranium veins are frequently not much more than a few inches in width, and a typical deposit may consist of a network of small rich shoots pinching out in several directions, so that mining dilution must be extensive in occurrences of this type and the total vein matter mined may include appreciable amounts of waste material. Dissemination of uranium minerals, either throughout as a disseminated deposit or in associated minerals, is very prevalent. The association of uranium minerals with others is often very intimate and instances are known of Canadian occurrences in which pitchblende grains finer than 200 mesh contain inclusions of other minerals.

## COMPLEX NATURE OF TREATMENT

With sedimentary deposits such as uraniferous phosphates and black shales, uranium minerals as such are seldom identifiable. Most of the uranium in known phosphate deposits probably occurs as a replacement in fluorapatite or collophane, but some is contained in the clay minerals and organic matter, and this may also be the location for uranium in black shales. Where the uranium content is sufficient to consider such deposits as economic sources, the treatment problem, involving the extraction of an element which is either a replacement of another in a mineral complex or has been adsorbed by a mineral, is unusual when compared with those of other metals. Thus it is clear from the various types of uranium-bearing material that have to be handled that the treatment of the material is very often of a complex character. Treatment problems include features which are not usual for other ores, while the uranium minerals themselves are more variable in properties and composition than most other minerals.

Different papers presented at the symposium show that physical methods of concentration include electronic sorting in which the Lapointe picking belt makes use of the radioactive properties of the uranium-bearing minerals to reject waste below a prescribed grade. This method has been applied to some Canadian ores, but its application appears to be limited to coarse sizes down to about one

inch. Where the uranium material is associated with heavy minerals such as sulphides, ilmenite, haematite, etc., it is sometimes possible to apply heavy media separation by conventional methods. In some instances it is possible to apply gravity concentration through the medium of jigs and tables, particularly when the material contains much heavy pitchblende, as at Port Radium, Canada, where about 70 per cent recovery has been obtained. Many of the uranium-bearing materials, however, have gravities too low for satisfactory separation by gravity methods.

Flotation methods have been successfully used on some materials; for example, a recovery of 85 per cent is obtained on parsonite at a French mine, while it is also employed in the processing of uraninite of the Rhokana Corporation. Chemical methods of separation are normally applied where physical techniques are ineffective and generally speaking, ores containing an appreciable amount of uranium as secondary minerals, or those in which the values are finely disseminated and are liberated only by very fine grinding, are most suited to chemical treatment. In many cases chemical treatment has to be applied to make the process economic, and the main process consists of leaching the material with either acids or carbonates by well known methods.

## PRODUCTION OF VANADIUM

Since the great bulk of the Commonwealth's primary vanadium has for the past few years come from the Abenab West mine in the Otavi District of South West Africa, it is interesting to peruse a paper which was presented at the symposium dealing with this project. Prior to 1946 the bulk of Commonwealth vanadium material came from the adjacent Abenab mine, but as no new ore was being developed, attention was turned to the Abenab West mine. From the latter mine large tonnages were tested in the Abenab plant but the material proved unamenable to the usual methods of gravity concentration and recovery ranged from 30 to 45 per cent only, and it became obvious that different recovery methods would have to be applied to the Abenab West orebody. This is in the form of an irregular fissure from 2 to 40 ft. wide, conformable with the dip of the enclosing platy limestones and filled with clay and detrital material. The ore minerals are vanadinite, descloizite, and cerussite, which occur disseminated or in drusy cavities or veinlets within the clay, indicating that the vanadiferous solutions must have deposited the minerals *in situ;* the gangue consisting of ferruginous clay, iron oxides, dolomite, calcite and quartz. Both vanadinite and descloizite are variable in composition with the proportions of lead and vanadium seldom precisely the same in any two specimens, while the distribution of the minerals themselves in the ore is even more variable.

Grade and relative proportions of the three valuable minerals are very difficult to predict and sampling can do little more than confirm that a particular locality is mineralized. This, together with the weak structural nature of the ore and a very large volume of underground water, presented a complicated mining problem. In its vertical development the orebody has exhibited characteristic changes, with cerussite and vanadinite giving way to a preponderantly desclozite mineralization at depth.

The size distribution of the ore is an interesting feature from the mineral-dressing point of view, for even without grinding, nearly 40 per cent of the ore is finer than 200 mesh and 25 per cent is finer than two microns. The cerussite shows a strongly individual trend with very little present in sizes finer than 200 mesh, and had this been the only valuable constituent, simple gravity concentration would have been effective. However, the vanadium minerals persist into the finest size fractions and the vanadium distribution curve closely follows the weight curve, with 33 per cent of these values finer than 200 mesh and over 20 per cent finer than two microns.

Investigations on this material were carried out in the Bessemer Laboratory of the Royal School of Mines, and examination of the mineralization and size distribution made it apparent that flotation was the only concentration method with any promise of efficiently producing a commercial vanadium product from the ore. After much research and experimental work suitable flotation processes were evolved which gave recovery figures of well over 80 per cent, but the gradual growth and evolution of the plant, with changes in the nature of the material treated make it difficult to present representative results.

In addition to the day-to-day variations in the mine ore which complicates the operations of the plant, pronounced long-term changes in mineral association which are characteristic of secondary orebodies have occurred as the depth of mine has increased. The past year has, for example, seen two such changes as the proportions, first of cerussite and then of vanadinite, decreased; leaving descloizite as the predominating valuable mineral Over certain periods smelting and other problems have had to take precedence over purely mineral-dressing considerations, and alterations in the production schedule have had to be made which were not necessarily favourable to mill recoveries.

Since descloizite contains lead and zinc as well as vanadium, it forms the basis of the lead-zinc-vanadate ores from which ferro-vanadium for the steel industry is manufactured, as well as vanadic acid for catalysts and as a colouring medium. For such purposes it is not necessary to have vanadium in a high state of purity. On the other hand, for certain alloying purposes, a high purity vanadium is essential, and the production of this material is described in a paper from the Magnesium-Elektron laboratories, where a pilot plant producing vanadium sponge has been put into operation. In carrying out tests in these laboratories, 80 per cent ferro-vanadium was selected as the best commercially available raw material because of its high vanadium content and low oxygen. The iron content is removed by chemical methods and a vanadium sponge of about 99.7 per cent purity is finally obtained.

## METAL FOR FABRICATION STUDIES

A paper from the Culcheth Laboratories of the U.K.A.E.A. gives details of experimental work which has been done on the extraction of ductile vanadium by oxide and halide reduction, consisting of the metallic reduction of vanadium oxides and a chlorination process, respectively. Most of the vanadium which has been produced in the U.S.A. has been produced by calcium reduction of vanadium oxides, either the tri-oxide or pent-oxide. The object in the Culcheth laboratories was to study some of the variables involved and to produce ductile metal in kilogram quantities for fabrication studies.

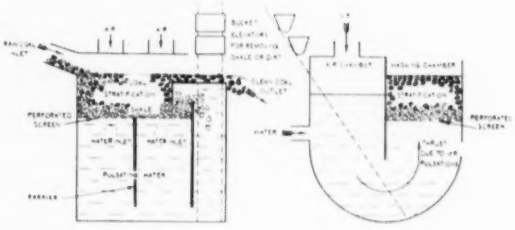
Billets in the form of flat discs with a height to diameter ratio of 1 to 8 have been produced, and when attempts were made to obtain a more cylindrical billet difficulty was experienced either from voids dispersed throughout the body of the ingot or from a large pipe extending from the upper surface. Pieces cut from the billets were subjected to a hardness test and those with a hardness below 180 V.P.N. could usually be rolled to strip 3 - 4/1000 in. thick without any intermediate annealing. The softest billet obtained during the investigation had a Vickers hardness varying between 105 - 119 over a cross-section of the billet with a mean value of 112. This vanadium sample contained 0.04 per cent oxygen and 0.004 per cent nitrogen. From this piece of research it is concluded that while the oxide reduction process will give massive ductile vanadium, difficulty is experienced in obtaining sound regularly-shaped billets suitable for use in a fabrication process.

# Modern Coal Preparation Plants of the N.C.B.

**The percentage of incombustible or non-bituminous matter found in coal as mined from deposits in the United Kingdom has increased considerably during recent years, and to deal with the problem the National Coal Board is building coal preparation plants for the removal of dirt or incombustible material as the coal leaves the pit. The following article describes the general features of a modern coal preparation plant, and is based on those plants recently erected in the No. 1 Area, Durham Division N.C.B., at Wardley Colliery by Nortons-Tividale Ltd. and at Westoe Colliery by Simon Carves Ltd. The drives for all equipment in both installations are provided by motors manufactured by The English Electric Co. Ltd. The article is condensed from a paper by A. R. Johnson, B.Sc., A.M.I.Mech.E., A.M.I.E.E., A.M.I.Prod.E., which appeared in *The English Electric Journal*, Vol. 14, No. 4.**

At the Westoe and Wardley coal preparation plants the Baum jig washer is used, involving the use of compressed air to effect the necessary pulsation of a bed of raw coal in order to form it into layers according to the specific gravities of the constituent materials. The Baum washbox is well known, and is a large fabricated tank, longitudinally divided into an air-chamber and a washing chamber.

In order to effect the separation of coal and middlings the washbox is divided into two sections. In the first the heavy dirt sinks immediately to the bottom of the bed and is removed as refuse. Coal together with middlings passes over the first weir and re-washing takes place in the second compartment. This time the middlings and light shale form the bottom of the bed which is removed through the refuse gate, lifted by bucket elevator to a crusher, and returned to the first compartment for re-washing. The degree to which coal is cleaned can be regulated by adjusting the water supply, air pressure, and refuse discharge gates.



**Sections illustrating the principle of the Baum washbox**

## COAL PREPARATION PLANT

While the functions of a coal preparation plant can be simply stated as the cleaning and grading of coal, the practical application is complicated by the fact that run-of-mine coal varies considerably in both size and quality. Further problems are presented by the necessity of using a closed water circuit, and at the same time preventing an undesirable concentration of solids in suspension.

The coal preparation plants at Wardley and Westoe can conveniently be divided into :

(a) Raw coal plant ;
(b) Washery ;
(c) Slurry treatment plant which involves froth flotation equipment and rotary vacuum drum filters, and flocculation plant and refuse filter presses.

At Westoe, wagons bringing R.O.M. coal from neighbouring collieries are hoisted 22 ft. to the tippler level by pushbutton-operated automatic hoists each driven by a 150 h.p. slipring motor. The 55 h.p. tipplers lift and invert each full wagon so that its contents are emptied into large concrete storage bunkers. From the bottom of the bunkers vibro-feeders provide a steady discharge on to primary screens which grade the R.O.M. coal into sizes of 1 to 0 in., 6 to 1 in., and above 6 in. The 1 to 0 in. and 6 to 1 in. raw coal is taken by conveyor to further storage bunkers above each washbox in the washery building.

R.O.M. coal above 6 in. is fed on to a picking belt where large pieces of obvious shale are removed by hand. The coal passes through crushers and then back to the primary screens for regrading. Crushing not only prevents jamming of the washbox to oversize material but also helps to separate any shale which may be contained in the coal.

At Wardley the arrangements are similar but not so elaborate, as the capacity of the plant is 200 tons per hour compared with 500 tons per hour at Westoe. In this case wagons are discharged by hand into a track hopper and then taken by conveyor to the raw coal plant storage bunkers. The maximum size is again limited to 6 in., but further grading on primary screens is not carried out, as the plant is designed for one washbox only. At Westoe, however, to achieve the greater throughput, two washboxes deal with 6 to 1 in. raw coal and two washboxes with 1 to 0 in. raw coal.

**View of Westoe coal preparation plant from raw coal end**

R.O.M. coal is not only delivered by railway wagons to the Westoe plant but is also fed to the raw coal section by a conveyor direct from Westoe Colliery. In fact, when Westoe Colliery is completely reconstructed, the bulk of the coal to be cleaned will be transported by direct pit-to-washery conveyor, as also applies to Wardley.

As mentioned, at both Wardley and Westoe the Baum method of separation is used. At the washbox at Wardley Colliery the reciprocating air valves give pulsations which lift the bed of raw coal and allow stratification to take place. The first bucket elevator removes heavy dirt discharged through the first shale discharge gate, while the second elevator removes middlings which are then crushed and re-washed. A con-

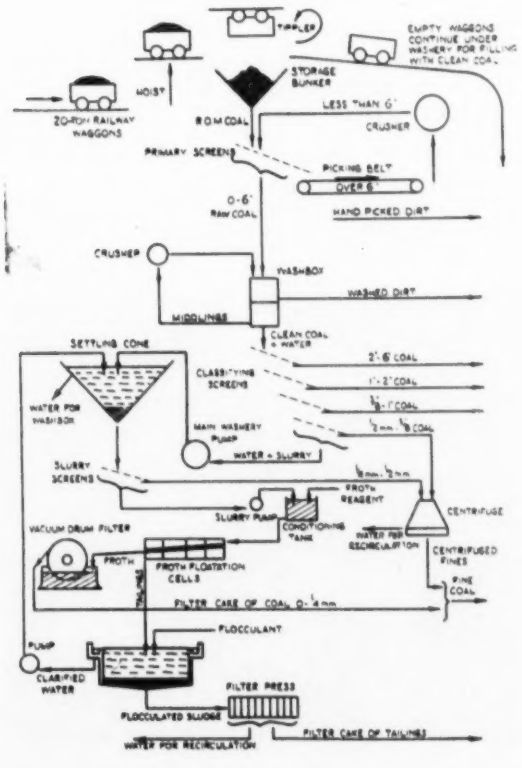
tinuous stream of water carries the clean coal over the second weir and on to the classifying screens. These are perforated plates jigged to and fro by eccentrics, which serve the purpose of giving a forward motion to the coal. Coal passing through holes in the plates drops on to other screens with smaller holes, and so on, until all the coal has been sized. Conveyors take the graded coal to waiting railway wagons.

The final screens are actually fine wire meshes and remove all remaining solids above ½ mm. These small coals (say ¾ in.-½mm.) contain a large percentage of moisture and are therefore centrifuged. Water together with solids less than ½ mm. is pumped by 125 h.p. centrifugal pumps to the top of large concrete settling cones. During these operations a quantity of fine particles in the water settles to the bottom of the cone to form a sludge, which is piped to the slurry screens where solids are removed down to about ½ mm. These fine particles are added to the ¾ in.-½ mm. small coal before centrifuging.

**Interior of the washery at Wardley showing classifying screens, slurry screen, froth flotation cells and drum filter**

At Wardley Washery raw coal enters the washbox and passes on to classifying screens, and sized products leave by conveyors. The fine coal screens are directly below the slurry screens in front of the bucket elevators.

As some 2,000-4,000 g.p.m. of water are required for each washbox it is essential for the water to be re-circulated. The water passing through the slurry screens, however, contains fine particles of coal and dirt in suspension which will eventually produce a high concentration of solids and slimes in the circulating water. Such pollution causes inefficient operation of the washbox due to the varying specific gravity of the circulating water. These fine solids are very abrasive when in high concentrations, causing considerable wear on pumps, valves, pipelines and screens. They also impose a heavier load on the main pumps, and the outgoing graded coal loses much of its attractiveness by being coated with a layer of fine damp dust.




**Simplified flow diagram illustrating the principle of operation**

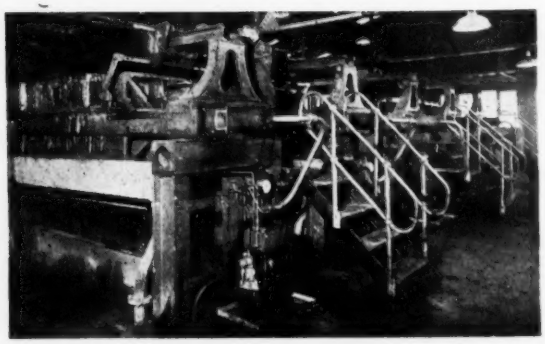
## THE PROBLEM OF POLLUTED WATER

A method frequently used in the past to keep the solids concentration to a reasonable level when operating a closed circuit system, was to bleed off a quantity of the polluted water and add the same quantity of make-up water. This raised many problems regarding the disposal of polluted water. Rivers and streams were often fouled and, when settling ponds were used, large tracts of valuable ground were lost to the colliery. Coupled with this was the expense of excessive make-up water, and the fact that a vast quantity of good quality coal was wasted.

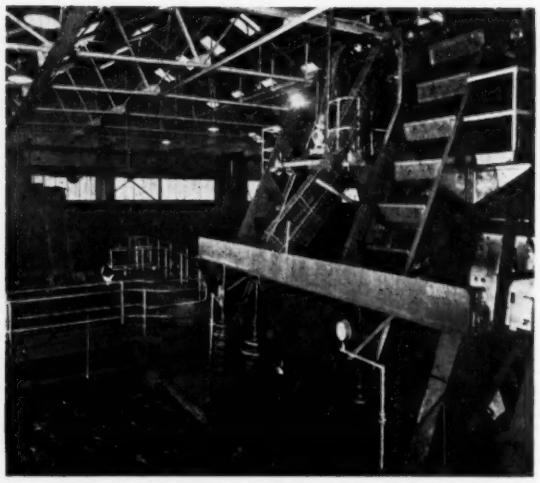
The modern approach is to treat continually a proportion of the water by froth flotation to remove the fine coal, and flocculate the remaining dirt or tailings to obtain relatively pure water for recirculation. Sludge formed by the flocculation process can easily be caked by filter presses for disposal.

The effluent passing through the fine slurry screens contains particles of pure coal and dirt. Dirt usually associated with coal is of high wettability, while coal is of low wettability and this can be further reduced by the addition of a suitable oil. Although the oil clings to the coal particles it does not affect the dirt, and the coal thus presents a water repellent or non-wettable surface to the water. A suitable frothing agent is added.

In practice a suitable re-agent is added to a percentage of the effluent from the slurry screens and mixed in a conditioning tank. The conditioned effluent is fed into the first of a bank of froth flotation cells, each of which has an impeller. A froth of clean coal is then removed from the top of the cells by means of froth paddles and taken to the trough of the rotary vacuum drum filter for de-watering. From the first cell the remaining effluent is passed to the second cell for further frothing, and so on until it has reached the last cell in the unit whence it emerges as an effluent containing the bulk of the dirt or high ash content particles, with only a very small proportion of coal in suspension. The effluent is passed to the flocculation plant.



**Filter presses and hydraulic pump driven by 1 h.p., 1,450 r.p.m. totally enclosed fan cooled squirrel cage motors at Westoe. The filter presses consist of a number of iron frames having nylon filter cloths which de-water the tailings supplied under pressure from dead weight pumps**



**Washbox, air valves, dirt and middle elevators at the Wardley plant, showing the two weirs with classifying screens, the reciprocating air valves and bucket elevators. Pulsations from these valves lift the bed of coal and allow stratification to take place**

**2 in. to —¼ in. classifying screens driven by 10 h.p., 730 r.p.m. totally enclosed fan cooled squirrel cage motors at Westoe. The mechanical parts are by Simon Carves Ltd.**

A slowly revolving vacuum filter picks up a blanket of the coal-bearing froth and removes most of the moisture present before discharging a relatively dry filter cake on to a conveyor. The conveyor takes the filter cake to a paddle mixer where it is mixed with centrifuged small coal and fines from the slurry screens. The equipment required for the drum filter includes a vacuum pump, vacuum tank, and dewatering pump.

While the main object in conditioning the water is to allow a closed water circuit to operate, it has been found that the quantity of coal recovered by froth flotation makes the system economically attractive.

The tailings from the froth flotation cells carry only material of high ash content, the pure coal having been removed in the frothing process. Tailings are delivered into a thickening tank for flocculation and clarification.

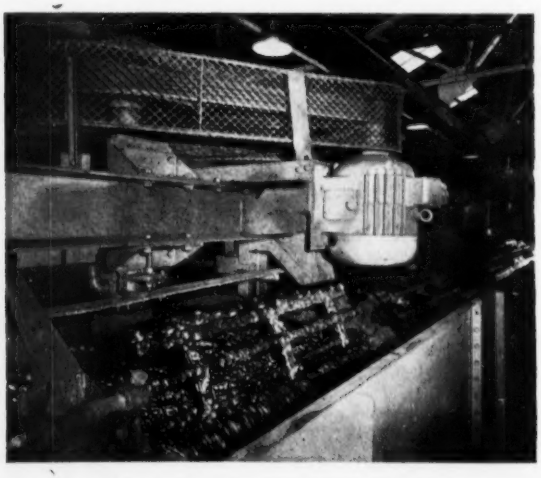
Flocculated sludge is pumped to filter presses where almost all the water is removed, leaving only a heavy mass of de-watered tailings which are conveyed to a refuse hopper for disposal.

## THE ELECTRICAL EQUIPMENT

It will be realized from the foregoing description that the duties of the motors involved in a coal preparation plant cover many types of drive. These include wagon hoists, pumps, large turbo-blowers, screening plant, crushers and conveyors of many sizes. The two hundred and thirty English Electric motors installed in the two plants are all totally enclosed, either fan cooled or closed air circuit, and with few exceptions are connected for direct-on-line starting. The only slipring machines are on the hoists and wagon tipplers at Westoe, where the rotor resistances are varied to give speed control. Wherever possible T.E.F.C. motors with standard dimensions to B.S. 2083 : 1954 are employed.

Motors are controlled from Non-English Electric cubicle-type contactor boards, automatic sequence of operation or sequence interlocking, according to the scheme employed, being provided for sections of the plant where a correct order of starting is essential. For example, the classifying screens, main pump, elevators, turbo-blower and all associated conveyors must be working before the raw coal is admitted to the washbox.

A large number of emergency stop buttons are conveniently situated throughout the washery and raw coal buildings to enable operators to shut-down sections of the plant immediately.



**Froth flotation cells, each pair having a 20 h.p., 1,440 r.p.m totally enclosed fan cooled squirrel cage motor, class LY, mounted vertically, at Wardley**

*KOEPE SYSTEM IN SOUTH AFRICAN GOLD MINES —III.*

# Evolution of Rope Factors on Koepe Installations in South African Gold Mines

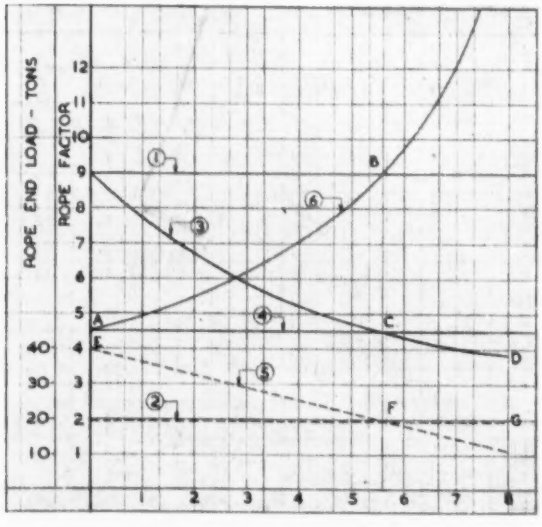
**The following article concludes the remarks concerning the effect of rope strength on Koepe installations in South African gold mines begun in our issue of March 30, 1956, and is the third in a series of articles discussing the efficiency of this system in the gold mines of the Witwatersrand and Orange Free State. The article is condensed from a paper presented at the monthly general meeting of the South African Institution of Mechanical Engineers on January 12, 1956, by L. T. Campbell Pitt, O.B.E., M.I.Mech.E., a Past President of the Institution, and F. G. Zeppenfeld and A. W. P. Hallett, M.A.(Cantab.), M.I.Mech.E., members. Subsequent articles will deal with the output of Koepe hoists and their power requirements.**

Referring to *The Mining Journal* of March 30, 1956, it will be recalled that, dealing with the application of the Union Regulations to rock hoisting only, three conditions have to be fulfilled simultaneously. These are :

(a) The maximum load attached to the rope must not exceed one-ninth of the breaking load of the rope ;
(b) The maximum combined weight of the attached load and that of the suspended rope must not exceed two-ninths of the breaking load of the rope ;
(c) The breaking load of the rope must not at any time be less than nine-tenths of its breaking load (new).

The relation between the breaking load of the hoist rope and the load attached thereto is termed the capacity factor and this term will be used hereafter. In the graph below, the horizontal line (1) shows a capacity factor of nine. The rope end load giving a capacity factor of nine on the discard breaking load of the rope is shown by the line (2). For a 2 in. rope having a new breaking load of 197.8 tons this end load has a value of 19.78 tons. At increasing shaft depths, by adding the weight of the suspended rope to that of the end load, the factor of safety may be determined and is shown plotted as curve (3).

Referring to conditions (b) and (c), the horizontal line (4) shows a factor of safety of 4.5. The end loads which added to the suspended weight of rope will give a factor of safety of 4.5 are shown by the line (5). The capacity factor given by each of these end loads is shown by curve (6).




**Factors and loading for 2 in. rope 197.8 tons, breaking load 7.07 lb. per ft. Horizontal figures represent suspended rope 1,000 ft. (1) capacity factor 0.9; (2) rope end load 1/9 x 0.9B=19.78 tons; (3) safety factor for end load 19.78 tons; (4) safety factor 4.5; (5) rope end load for safety factor 4.5; (6) capacity factor for end loads given by curve (5)**

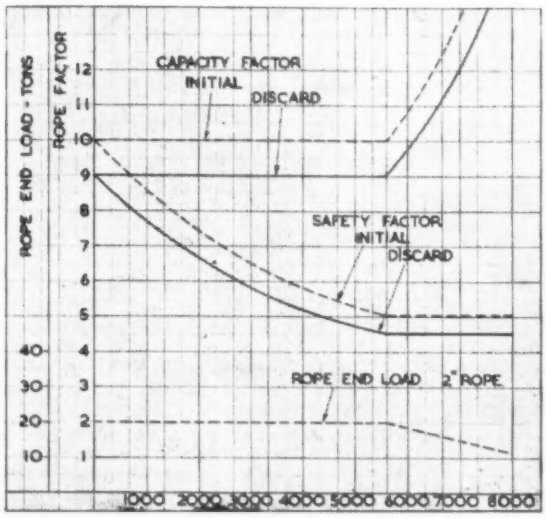



**Diagram showing rope end load which gives at discard a capacity factor of not less than 9.0 and a safety factor of not less than 4.5. Horizontal figures suspended rope (ft.)**

An examination of the curves of safety factor (3) and of capacity factor (6) shows that portions are inadmissible since they are contrary to the conditions of the Regulation. Portion C D of the safety factor curve, being below a value of 4.5, is inadmissible. Portion A B of the capacity factor curve is inadmissible, since it is below the value of nine. The rope end loads giving rise to these inadmissible factors are the portions E F of the line (5) and F G of the line (2).

It is also seen that the points B, C, F, lie on the abcissa coresponding to 5,600 ft. which is the critical depth for a rope of 128/140 ton steel as shown in the table published on page 395 of our March 30, 1956, issue. The summary of these results is given in the graph above, which shows the rope end load which gives a capacity factor of not less than nine and at the same time a safety factor of not less than 4.5.

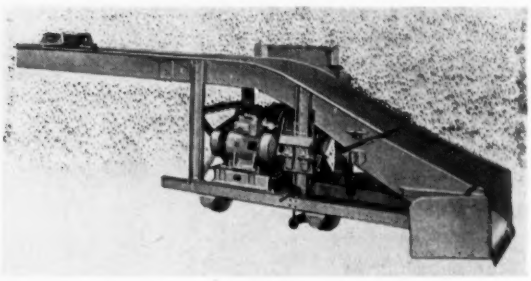
The highest factor of safety and the greatest payload can only be obtained by using high tensile steel. For low tensile steel, the payload disappears altogether for depths of 7,000 - 8,000 ft.

It should again be pointed out that in applying this Regulation to Koepe hoists, the term capacity factor has no separate significance. The load attached to the hoisting rope includes the weight of the balance rope as well as the weight of the skip and its contents. The capacity factor is therefore identical with the safety factor.

# MACHINERY AND EQUIPMENT

## A Redesigned Scraper Loader

The Joy scraper loader has recently been redesigned and is now available to handle either 36 in. or 54 in. scraper buckets. This has been achieved by making it possible for the 36 in. model to be converted to the larger size by the substitution of lateral members and floorplates.



**The redesigned Joy-Sullivan scraper loader**

The motor and double drum haulage are mounted on a separate sub-base as a cartridge unit in the loader frame. The unit can be removed simply and used for ordinary haulage duties if required. Electric motors up to 40 h.p., or compressed air motors to 35 h.p., are fitted as required. Operation and control of the bucket is by hydraulic thrusters controlled by light hand levers. The thrusters engage long-wearing clutch hands on the epicyclical gears on each of the drums. Easy maintenance of the scraper slide is ensured by the use of flush-bolted floorplates, which can be removed without dismantling the machine and replaced without welding or structural alterations. A special wearing plate, 2 ft. sq., is inset at the point of contact of the wire haulage rope. This can be renewed quickly and inexpensively and means that renewal of the entire floor is not necessary.

The largest type of standard underground mine car with a rail clearance of 4 ft. 10 in. can be accommodated by the loader. One of these cars can be handled below the standard boom of 9 ft. overhang. An extension section can be fitted to give a boom length of 18 ft. which allows for the handling of one to three mine cars in a loading journey. The rail gauge of the loader can be adjusted to any figure between 2 ft. and 3 ft. 9in. The 36 in. model has a capacity of 30 tons per hr., using rope speeds of 235 ft. and 250 ft. per min. The 54 in. model, using the larger bucket, loads up to 90 tons per hr. The loader will work to full capacity in either form against gradients of 1 in 3.

## Measurement of Surface Crack Depth

Not only the existence of surface cracks, but above all their depth, determines the usability of workpieces or assembly elements. With the usual testing methods however, measuring the depths of cracks is limited, difficult and very inexact. The crack depth indicator of the Karl Meyer Apparatebau, Hamburg, permits measurements of surface crack depths in a simple manner. It is a direct reading instrument giving results to better than 0.1 mm., and consists of a feeler and a pointer gauge. The equipment is operated by a 6 v. direct current which may be taken from a battery or the mains by means of a transformer.

In operation, the feeler is put on the workpiece and sends a direct current through it by means of a pair of contacts. A second pair of contacts taps off the voltage drop on the surface of the work. The potential drop is constant if the surface is free of cracks, but changes at once when meeting a crack. The amount of the potential change is a reliable measure of the crack-depth. The indicator-scale may be directly calibrated according to the depth of the cracks.

The standard model is suitable for testing a plane surface or a curved one of radius down to 25 mm. and crack depths up to 2 mm. Special designs may be used for testing crack depths up to 5 or 10 mm. or for testing concave moulds, hollow bodies, toothed gears, etc. The unit is fully described in *Werkstatt und Betrieb* (Germany).

## Rubber Knee Pads for Miners

A rubber knee pad, specially designed for use by miners hewing coal while crouched in the narrow seams of the British fields, has proved so successful that supplies are to be made available to every industry in which workers are involved in kneeling. The pads, introduced a little more than a year ago and half as light as the former standard leather type, are now used by miners throughout the United Kingdom.

The secret of the success of the pad, made by the Expanded Rubber Co. Ltd. and known as the Rubazote Knee Pad, is the closed cell construction of the rubber which gives it the lightness of a sponge without the water absorbing qualities of sponge. Each cell is completely isolated from its neighbours by a tiny individual air-filled balloon. Water cannot enter the cells if a puddle is knelt in and the pad is also so designed that pieces of grit cannot slip between the knee and the inside of the pad.

## New Fire Fighting Appliance

The latest appliance for fighting fires involving bulk quantities of oils, spirits and other inflammable liquids is a new foam-making branchpipe only 18 in. in length and 6¼ lb. in weight, i.e. almost half the size and weight of previous models.

Developed by The Pyrene Company, Ltd., and known as Model F.B. 5X, the new branchpipe is particularly suitable for those industries where inflammable liquids such as oils are used and hence appears to have applications within the mining industry. The unit instantly converts water into dense, fire-smothering foam which it delivers at the rate of 500 g.p.m. to the blazing surface, blanketing the flames and affording a safeguard against re-ignition. The branchpipe may also be set to project water only for extinguishing freely burning materials and for cooling down purposes.

**The new Pyrene F.B. 5X foam-making branchpipe. Foam compound is being induced from a knapsack tank on the operator's shoulders**

The new branchpipe uses 2 gal. of foam-making compound and 50 gal. of water per min. at a pressure of 100 p.s.i. It automatically induces foam compound, water and air in the correct proportions, and produces a consolidated foam jet which will reach to a distance of more than 65 ft. The foam compound may be induced from a knapsack tank worn on the operator's shoulders, from a pick-up tube and static foam compound container, or by means of inline inductors. Where required, the F.B. 5x may be used with a pre-mixed solution of foam-compound and water.

# MINING MISCELLANY

A Philippine Bureau of Mines call for tenders to develop the Surigao nickel/iron deposits has drawn responses from 17 foreign firms. Three U.S. firms have sent survey teams to the area.

* * *

The Demag Engineering firm has delivered an electrolytic metal separation plant to India. The plant will extract silver and copper from metal alloys, while nickel and zinc sulphate will be available as by-products.

* * *

The Ministry of Mines, Bolivia, is sending three Bolivian engineers to Germany to participate in the research which Krupps are conducting with the object of discovering a suitable process for tin smelting in Bolivia.

* * *

Crane Company and Vitro Corporation of America have entered into a joint operation to produce thorium, rare earths and heavy minerals from monazite, as well as rutile, ilmenite, zircon and kyanite.

* * *

The Central African Exploration and Mining Company (Private) Limited have applied to the Mining Affairs Board for three exclusive prospecting reservations in the Hartley and Salisbury mining district. The applicants wish to seek and mine thorium, uranium and any base metals discovered.

* * *

National Lead Company has taken over operation of the Atomic Energy Commission's uranium processing mill at Monticello, Utah, as from April 1. This mill had been operated for the Commission since 1949 by the Gallagher Company, of Salt Lake City, which has advised A.E.C. that it did not wish to renew the contract. National Lead operates three other facilities for the Commission.

* * *

It has been announced that Chibuluma will produce during April. It will be the first new mine to open on the Copperbelt for 25 years. Full production will be on a scale of 480,000 tons per annum with an expected yield of 16,000 tons of copper and 250 s.tons of cobalt. The copper concentrate will be road hauled to Kitwe and thence railed to smelters at Mufulira. Cobalt concentrates will be stockpiled at Chibuluma until completion of the cobalt plant at present under consideration. Refining will take place at Ndola.

* * *

A preliminary investigation is being made into the possibilities of producing oil from coal from the Lubimbi coalfield, near Wankie, Southern Rhodesia, and of setting up a large-scale petrol producing industry and allied chemical industries. Rhodesian Anglo American Limited and Wankie Colliery Ltd., equal shareholders in Lubimbi Coal Areas Limited, are behind the project, which has been approved by the Southern Rhodesia Government. In a statement they said that a full report on all technical and financial details should be available in about two years' time. The estimated reserves at Lubimbi exceed 80,000,000 tons and proved reserves would support an oil-from-coal industry using 1,600,000 tons a year for 50 years.

## PERSONAL

The following have been elected to form the Committee of the London Metal Exchange for the ensuing year:

Messrs. V. S. Booth, W. G. Buchanan, G. F. A. Burgess, A. H. Cheek, F. C. Chisnell, J. H. Evers, L. Guy, A. H. Inchley, A. R. Matthias, K. A. S. Morrice, J. D. Oliff-Lee, P. G. Smith, W. O. Stern, A. A. Thomson, F. F. Wolff.

* * *

Mr. Eric Ernest Howell has been appointed principal of the Copperbelt Technical Foundation in Northern Rhodesia. He is at present principal of the Pietermaritzburg Technical College in Natal. The Foundation, which is to provide technical training for young Europeans, has been allocated a sum of £400,000 by the copper mining companies.

* * *

Rio Tinto (Canada) have announced that all preliminary arrangements have been completed for the proposed amalgamation of the company's interests with those of Mr. J. H. Hirshhorn, which will now take place. The company's name will be changed to The Rio Tinto Mining Company of Canada, Ltd. Its directors and officers will be: Mr. J. H. Hirshhorn, chairman; Mr. J. N. V. Duncan, president; Mr. R. W. Wright, managing director; Mr. W. B. Malone, vice-president and treasurer; Mr. W. H. Bouck, Dr. D. R. Derry, Mr. E. B. Gillanders, vice-presidents; Mr. Sam Harris; Senator Hayden, Mr. B. R. P. Mackenzie, Mr. Leo Model, Sir Mark Turner, directors.

Mr. J. A. Weatherley has resigned as a director of Ashanti-Obuasi Reefs Limited, having taken up an appointment in Nigeria, and Mr. C. W. A. Ison has been co-opted a director. Mr. Weatherley has also resigned from the Board of the South American Exploration Company Limited.

* * *

Mr. R. Mark Ward, representative of Messrs. M. Godoletz of London, has just completed an extensive tour of Southern Rhodesia and the Union of South Africa in connection with the company's metals and ores interests.

* * *

Mr. J. G. Boddy has been appointed manager, Turbine Contracts Department, of B.T.H. in succession to Mr. C. K. Bird, who has relinquished the position to take up consultative duties with the company.

* * *

Mr. Frank Perkins, chairman and managing director of F. Perkins Ltd., was among High Sheriffs appointed by the Queen at the traditional ceremony of pricking the roll with a steel bodkin.

* * *

Mr. E. A. Murphy, chief of the team of research chemists who founded the world industry of latex foam rubber 28 years ago, and Mr. Henry Trevaskis, A.F.R.Ae.S., who has developed the gun-firing controls used in British fighter aircraft since 1937, are the new key men of Dunlop's research and development organization at Fort Dunlop, Birmingham.

* * *

Mr. T. G. B. Davies, of London, has been appointed as an expert in petroleum geology to Turkey by the United Nations Technical Assistance Administration.

* * *

Mr. Philip R. Lake, of London, has been appointed a mining expert to Burma by the United Nations Technical Assistance Administration.

* * *

Mr. J. W. Strath has been appointed general sales manager of Spartan Air Services Limited and Canadian Aero Services Limited, of Ottawa.

* * *

A symposium of Nuclear Energy was held by the Institution of Mechanical Engineers at its general meeting in London on Wednesday, March 28, 1956. It was arranged in conjunction with the British Nuclear Energy Conference.

* * *

A general meeting of the North Staffordshire Institute of Mining Engineers will be held in the M.E.B. Lecture Hall, Back Glebe Street, Stoke-on-Trent, at 5.30 p.m. on April 9.

* * *

A general meeting of the North of England Institute of Mining and Mechanical Engineers will be held in the lecture theatre of the Institute, Neville Hall, Newcastle upon Tyne 1, at 2.30 p.m. on Saturday, April 7.

## CONTRACTS AND TENDERS

*India.*—TEN/18637. Diesel driven scrapers, crawler shovels, heavy duty rear dumpers, drilling equipment, etc., for overourden requiring blasting and for cutting and removal of coal. Issuing authority, Director General of Supplies and Disposals, Shahjahan Road, New Delhi (Tender No. SPIA/95-G/1). Closing date 18/4/56. B.O.T. Ref.: E.S.B./8155/56. Telephone enquiries to Chancery 4411, Extension 738 or 771.

The International Co-operation Administration (I.C.A.) has announced the following future authorizations:

| | *Contract Period* | *Terminal Delivery Date* | *Amount (in U.S. dollars)* |
|---|---|---|---|
| *Spain* | | | |
| Copper and copper products (PA No. 52-692-99-D7-6203) | 9/3/56-31/7/56 | 31/10/56 | 38,000 |
| *Vietnam* | | | |
| (PIO/C No. 30-82-075-5-60145) | | 30/6/56 | 377,000 |
| (includes construction, mining and conveying equipment, $50,200) | | | |
| *Bolivia* | | | |
| Construction, mining and conveying equipment (PA No. 11-740-99-A1-6218) ..... | 13/3/56-31/8/56 | 31/8/57 | 77,000 |

B.O.T. Ref.: E.S.B./8433/56/ICA. Telephone enquiries to Chancery 4411, Extension 360.

*This information is supplied by the Special Register Information Service of the Board of Trade, Lacon House, Theobalds Road, London, W.C.1.*

# METALS, MINERALS AND ALLOYS

**COPPER.**—In spite of the quietness induced by the incidence of the Easter holiday, copper has maintained its slight recovery in the United States. The custom smelters are now quoting 50½ to 51 c. per lb. for May delivery after at one time going down as far as 50 c. No. 2 scrap copper is still quoted at 42 to 42½ c. per lb. but only small tonnages are said to be coming forward. The recovery was to have been expected for the break in prices had gone just about as far as was justified in the present circumstances. Demand in the United States is still good enough to prevent any drastic fall in prices, there is quite a lot of stockpiling to be done and there is a good deal of "borrowed" metal to be paid back; but above all there is good reason to stock up. In the circumstances, and until the big producers make some move themselves, a halt to the decline was justified.

The good reason for stocking up was provided by the Mine Mill and Smelter Workers' Union which has just announced its wage demand for the next contract; it wants a general increase of 20 c. per hour, unemployment pay and a number of other fringe benefits. All forecasts that supply and demand will be in balance in the second half of this year presuppose an absence of strikes, but with wage demands of this order in the offing a strike in the United States is quite a possibility.

The Anaconda Sales Company has announced that the pricing formula published about a week ago has been abandoned. In its place, the company will base the price for its Chilean electrolytic copper on the average of the bid and asked quotations for spot copper at the first session of the London Metal Exchange, without making any of the previous deductions and additions for freight. The average of the L.M.E. quotations for the week, after conversion to the U.S. currency basis, will be therefore the delivered price to consumer plants in the United States. The average L.M.E. quotation will be for the week prior to the week in which the copper is shipped. Meanwhile, the Kennecott Copper Corporation has announced that it has agreed to price its Chilean output on a similar basis. Full details of the new arrangement are not yet available, but they are understood to have taken effect from March 28. They are not identical as far as is known with Anaconda's, but Anaconda's original formula was even more at variance.

W. and O. Bergmann has been appointed by Anaconda Sales Company, New York, to take charge of sales of Chilean copper in Germany and Austria.

The U.S. Department of Commerce has announced second quarter export quotas identical to those for the first quarter, namely 3,000 s.tons of new and old copper scrap, 6,000 s.tons (copper content) of new and old copper base alloy scrap containing better than 40 per cent copper and 600 s.tons (by metal weight) for copper base alloy ingots and other crude forms. Export of refined copper of domestic or Canadian origin will in general not be permitted.

Japanese smelters have increased their price for 70 per cent of electrolytic copper from 374,000 yen to 410,000 yen per tonne; the price of 450,000 yen for the remaining 30 per cent is unchanged. The increase is attributed to higher prices for domestic and American scrap. Japan is not now exporting electrolytic, although she has outstanding export commitments. Imports are to be allowed to help keep domestic prices down, and a recent announcement from Chile states that Japan has made an initial purchase of 19,100 tonnes and is becoming, according to the Copper Department, "one of the great copper consuming countries".

The railway between Bancroft and the Copperbelt is now ready and about to take its first traffic.

It is reported that the Pacific Gas and Electric Company has agreed with Aluminium Company of America on the purchase of 145 miles of aluminium transmission lines to replace existing copper lines that have been in use for 30 years. It is expected that at current copper scrap prices the company can have a new transmission line and a balance of about $150,000. The manager of the company has said that "We are shifting to aluminium all over the lot because of the price situation in copper. We are going to eliminate copper conductors wherever and whenever we can do so and still conform to good engineering practice".

**LEAD.**—Lead has been a steady but fairly quiet market in the United States on the basis of 16 c. per lb. New York. In part the Easter holiday was to blame but there is an absence of pressing demand as well. It is expected that the offerings to the stockpile will be rather larger than for some months past.

**TIN.**—Tin continued to recover and spot straits metal now stands at 100 c. per lb. The effects of the Easter holiday seem therefore to have been shaken off. There are a number of factors making for firmness. First is the apparent willingness of President Eisenhower to allow the Texas smelter to continue operating till January 31, 1957 (which is discussed elsewhere under "Notes and Comments"). This will presumably remove the threat of a sudden heavy tin surplus in mid-summer. It is, therefore, too early to start bearing tin. The second is the continuing good commercial demand in the United States. It is said that deliveries of tin mill products in March were the heaviest for this year and that preliminary figures for April show that the movement is being well maintained. Finally, although the situation in Malaya seems more settled, the outlook in the Middle East, which has almost a direct effect on tin sentiment, is very uncertain. American consumption of tin in January was 8,135 l.tons, an increase of 8 per cent and the highest monthly total since January, 1951.

Tengku Abdul Rahman has rejected a proposal for renewed negotiations with the Communists and now demands their unconditional surrender.

Employees in the Chinese tin mines have decided to organize. A trades union is to be established to look after the 12,000 employees in the 400 mines constituting the Chinese section of the industry. The Malayan Mining Employees Union caters only for workers in the European owned tin mines.

**ZINC.**—The zinc market in the United States was less affected than the lead market by the incidence of Easter. On the basis of 13.50 c. per lb. East St. Louis for prime western grade, demand for the metal was quite steady. In the recent past demand for prime western grade has much exceeded that for the special high grade, but in the last few days demand for the latter was noticeably picking up. Zinc producers do not appear to have been unduly worried by the decline in output from the motor industry. For one thing demand in the last quarter of 1955 was so strong as to be embarrassing; for another the producers are now able to supply other consumers of high grade zinc and in this way perhaps lessen their dependence on the motor industry.

**ALUMINIUM.**—As was to be expected, Alcan has fallen into line with the price increases announced by U.S. producers last week. As a result, the U.K. price of Canadian aluminium ingots has been raised by £10 a ton to £189 a ton. The last increase in prices—£8 a ton—took place on January 1 this year. Despite the latest increase, which brings the price of the metal to roughly twice the pre-war figure of £94 a ton, aluminium remains relatively the cheapest of the metals. Over the same period the prices of copper and lead have increased eightfold, while zinc and tin are respectively 6½ and 3½ times as dear.

In view of the growing shortage of hydro-electric power in the U.S., it is noteworthy that Reynolds Metals are considering new plant expansion in northern New York and Canada. The firm has been negotiating with the New York Power Authority for St. Lawrence River power to supply the large amount of electricity required for contemplated aluminium reduction operations in northern New York State. The seaway would permit waterborne shipment of raw bauxite to this plant and the finished metal could be moved by lake freighters to industrial centres. Reynolds are also studying the possibility of a $100,000,000 primary aluminium plant in the Baie Comeau area, 200 miles east of Quebec, where British Aluminium are installing a $125,000,000 plant.

Reports that Alcoa will build a new smelting plant near Evansville, Indiana, have been described by the company as premature and inaccurate. The company has several possible locations under the consideration, but no definite decision will be reached until it is assured of a satisfactory plant site, an adequate fuel supply, and essential service facilities.

Péchiney's production of aluminium rose to 108,000 tons last year from 99,000 in 1954. Sales of the joint organization Aluminium-Francais, which also acts for the Ugine Company, totalled 138,000 tons against 120,200 tons in the previous year. The company's plant at Edea, in the Cameroons, is scheduled to start operations in 1957 and to reach full production in 1959. The chairman of Aluminium-Francais has asked the Government to raise the domestic price of aluminium from the current level of about 173.50 fr. per kilo in order to offset higher production costs. He added that the unsettled state of the copper market had stimulated demand for aluminium, notably in the electrical equipment industry.

**CORUNDUM.**—About 750 piculs of Malaya's newest mineral find, corundum, left Penang recently for an American firm in California. The mineral is obtained at the Kramat Pulai mines near Ipoh as a by-product of tin mining and is hand-sorted from waste. Corundum, one of the hardest natural materials known, is used mainly for abrasive purposes. For many years the Transvaal has produced a very high percentage of the total world supply.

**MAGNESITE.**—The output of the Austrian magnesite industry in 1955 amounted to 991,008 tons of crude compared with 839,148 tons in 1954.

**MANGANESE.**—In vetoing recently the minerals purchase measure passed at the last session of Congress, President Eisenhower showed great political courage. Proponents of a domestic minerals programme have returned to the attack with a mineral Bill which would provide for the payment of a production bonus to producers of domestic minerals and which would set up a programme for the beneficiation of manganese ores. The measure has the backing of an imposing list of legislators representing both major parties in Congress. Having regard to the intensive effort currently being devoted to the beneficiation of low-grade domestic ores and the recovery of manganese from slag, the fortunes of this highly controversial measure will be followed very closely by exporters of minerals, particularly in the principal manganese producing countries.

Meanwhile a satisfactory demand for manganese ore is reported from both sides of the Atlantic. There was considerable speculation as to whether India would reimpose the *ad valorem* duty on manganese ore, but this uncertainty seems to have been dispelled by the absence of any reference to this duty in India's budget proposals.

**SELENIUM.**—Early in the year the world's largest deposit of primary selenium was found in Wyoming. Now comes a report that the Yosemite Uranium Corporation has uncovered a body of selenium on its group of claims near Cisco, Utah. The U.S. Bureau of Mines took samples from the property, which assayed 0.07 per cent. The erection of a mill in the area is reported to be under consideration. Hitherto, selenium has been wholly a by-product metal.

**SULPHUR.**—According to the Freeport Sulphur Company the world picture for sulphur in 1955 was one of approximate balance between supply and demand. Competition among sulphur producers has been increasing materially, especially in markets outside the U.S. The demand for sulphur continues to grow throughout the world and there is evidence that it is increasing at a more rapid rate than that of industrial and agricultural activity in general. During 1955 Freeport's production of sulphur exceeded 2,000,000 tons for the second consecutive year.

**URANIUM.**—The possibility of a new source of uranium is indicated by an announcement by the Atomic Energy Commission that a private organization is engaged on the development of a process for its recovery from lignite. It is evident that such a process, if economic, would have far-reaching consequences.

Details of a most interesting new geological theory which should assist the search for uranium in the Northern Territory are published in a report issued recently by the Bureau of Mineral Resources of the Department for National Development, Australia. The theory is based on an idea which should prove of practical assistance to geologists and prospectors when looking for uranium deposits. Investigations showed that in the Darwin-Katherine region, uranium occurred in fossil reefs which marked the edge of an ancient sea. It was apparently deposited originally in the sediments surrounding the edge of the reefs and later became concentrated by other geological processes into mineable deposits. Since the fossil reefs are easily recognizable, their location gives a valuable indication of the possible occurrence of uranium. This new theory is supported by the mode of occurrence of the deposits in the Rum Jungle and Alligator River areas. It may also have wider application in other areas. Copies of the geologists' full report are obtainable from the offices of the Bureau of Mineral Resources in Melbourne, Canberra and Darwin.

**ZIRCONIUM.**—At the request of the Atomic Energy Commission, the U.S. Bureau of Mines has begun restoring to operating condition the Goverment's zirconium plant at Albany, Oregon. Restoration is to be completed within 90 days. The A.E.C. solicited proposals on August 25, 1955, for the establishment of facilities to produce 1,000 s.tons of zirconium over a five-year period or 600 tons over a three-year period to meet the requirements of the expanded reactor programme. As a result of this offer ten proposals were received. Pending the construction of these facilities it has been found necessary to meet interim requirements which cannot be supplied from the stockpile or from the production of the Carborundum Metals Company, from which A.E.C. is now obtaining zirconium. The ten firms which submitted proposals have therefore been asked for expressions of interest in operating the Albany plant. It will be recalled that, after private industry entered the zirconium field and began producing the metal in quantity, the Albany plant was shut down last year at the direction of the Atomic Energy Commission. Its re-opening seems to point to a rapid growth in the demand for zirconium for nuclear purposes.

## LME Closing Metal Prices and Turnovers

| | March 28 | | April 5 | |
|---|---|---|---|---|
| | *Buyers* | *Sellers* | *Buyers* | *Sellers* |
| **Copper** | | | | |
| Cash | £394½ | £395 | £396 | £397 |
| Three months | £389½ | £390 | £391½ | £392 |
| Settlement | £395 | | £397 | |
| Week's turnover | 6,675 tons | | 3,625 tons | |
| **Tin*** | | | | |
| Cash | £779 | £780 | £768 | £769 |
| Three months | £770 | £772½ | £764 | £765 |
| Settlement | £780 | | £769 | |
| Week's turnover | 705 tons | | 885 tons | |
| **Lead** | | | | |
| Current half month | £119 | £119½ | £119½ | £119¾ |
| Three months | £118 | £118¼ | £118 | £118¼ |
| Week's turnover | 2,425 tons | | 2,575 tons | |
| **Zinc** | | | | |
| Current half month | £98¾ | £99 | £99¼ | £99½ |
| Three months | £97½ | £97¾ | £97¼ | £97½ |
| Week's turnover | 3,350 tons | | 4,900 tons | |

* On Thursday morning the Eastern price for tin was equivalent to £776¼ per ton c.i.f. Europe.

### OTHER LONDON PRICES — APRIL 5

#### METALS

Aluminium, 99.5%, £189 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £210 per ton
Crude (70%) £200 per ton
Ore (60% basis) 23s. 6d./24s. 6d. nom. per unit, c.i.f.
Bismuth
(min. 1 ton lots) 16s. lb. nom.
Cadmium 12s. 0d. lb.
Chromium, 6s. 11d. lb.
Cobalt, 21s. lb.
Gold, 249s. 3½d.
Iridium, £29/31 oz.
Manganese Metal (96%-98%) £269 according to quantity
Magnesium, 2s. 4d. lb.
Nickel, 99.5% (home trade) £519 per ton
Osmium, £24/27 oz. nom.
Osmiridium, nom.
Palladium, £8 0s./£8 10s. oz.
Platinum U.K. and Empire Refined £34 0s. oz. Imported £38 0s./£40 0s. oz.
Rhodium, £40/£42.
Ruthenium, £16/£18 oz.
Quicksilver, £86 10s. ex-warehouse
Selenium, 112s. nom. per lb.
Silver, 79⅛d. f.oz. spot and f'd.
Tellurium, 15s./16s. lb.

#### ORES, ALLOYS, ETC.

Bismuth .. .. .. .. 50% 7s. 3d. c.i.f. 40% 6s. 3d. lb.
Chrome Ore—
Rhodesian Metallurgical (semi-friable) 48% £15 2s. 6d. per ton c.i.f.
,, Refractory 45% .. £14 2s. 6d. per ton c.i.f.
,, Smalls 42% .. £12 2s. 6d. per ton c.i.f.
Magnesite, ground calcined .. £28 0s./£30 0s. d/d
Magnesite, Raw (ground) .. £21 0s./£22 0s. d/d
Molybdenite (85% basis) .. 8s. 2½d. nom. per lb. c.i.f.
Wolfram and Scheelite (65%) .. 259s. 0d./264s. 0d. c.i.f.
Tungsten Metal Powder (98% Min. W.) .. 21s. 0d. nom. per lb. (home)
Ferro-tungsten (80%-85%) .. 18s. 0d. nom. per lb. (home)
Carbide, 4-cwt. lots .. .. £39 3s. 9d. d/d per ton
Ferro-manganese, home .. £59 10s. 0d. per ton
Manganese Ore Indian Europe (46%-48%) basis 125s. freight .. .. .. 102d./105d. per unit c.i.f.
Manganese Ore (43%-45%) .. 95d./97d. per unit c.i.f.
Manganese Ore (38%-40%) .. 88d./90d. per unit
Brass Wire .. .. .. 3s. 7⅞d. per lb. basis
Brass Tubes, solid drawn .. 3s. 0⅛d. per lb. basis

**Owing to the long Easter Holiday break, no London Metal Market report appears in this week's issue. As readers will have observed, all market reports published in last week's issue were to Wednesday night because of Easter printing arrangements.**

# THE MINING MARKETS

*(By Our Stock Exchange Correspondent)*

The week under review included the Easter Holiday and markets behaved well in this traditionally quiet period. Prices were steady and, in some cases, firm, despite the Budget which is expected on April 17. The revenue figures for the year disclosed a surplus above the line of £397,000,000 although the overall deficit came out of £141,000,000. The gold and dollar reserves during March rose by $67,000,000 which, although giving no grounds for complacency, is a step in the right direction. The E.P.U. deficit was also sharply reduced at £500,000

Kaffirs were, on the whole, quiet. Some prices still continued to drift towards lower levels but the overall trend was erratic. London operators were reported to be switching from Orange Free State to Klerksdorp shares in the Johannesburg market. Among finance houses, there was little of interest to report. The maintained dividend by the Anglo American Corporation, despite the higher profits, disappointed some stockholders and the price eased. There has been some discussion in market circles over the possibilities of the forthcoming General Mining figures. The company has paid the same dividend for many years past and some optimists are looking for a higher distribution. Among individual Rand mines, City Deep were firm following the sale of 260 acres of land to the Johannesburg Corporation. The cash assets of the company are now thought to be in the neighbourhood of 9s. per share. The March returns issued during the week showed higher profit figures for many companies despite the incidence of the Easter Holiday. Doornfontein achieved a new tunnelling record and peak profits by Hartebeestfontein and West Driefontein caused an improvement in both these companies. Winkelhaak Mines were again favoured and finished the week at 16s.

In the Orange Free State group, record high profits were achieved by Harmony, the two President mines, and Welkom. Buyers came in for Freddies Consolidated following unconfirmed rumours about drilling east of Venterspost. The maiden profits announced by Merriespruit were well received. The company milled 75,000 tons of ore at a profit of about £50,000 inclusive of uranium. St. Helena fell back due to disappointment with borehole results near the new shaft.

In the West African market, the recovery in Ashanti's profits and the final distribution by Konongo caused some interest in these shares.

Diamonds showed little change despite the agreement on marketing with outside interests. Potgietersrust Platinums and Waterval recovered the ex-rights and dividend quotations.

Coppers finished the week mostly lower but well above the worst. The revival was accounted for by the rise on Wall Street. Bancroft were an outstanding feature with a big jump in price and Chartered were firm after the announcement of the company's method of assessing royalties. There was renewed interest in Rhodesia Katanga and Selection Trust was a strong market on the American Metal report. Tanganyikas proved disappointing and the shares fell back.

The sharp recovery in the price of tin failed to strike a spark from the market. Gopeng, which received favourable comment in the press due to its long life and the higher interim dividend remained unchanged. Nigerian and miscellaneous shares mostly lost the turn.

The activity in lead and zinc created a steady undertone in Barriers although prices were little changed. An outstanding feature was the shares of Burma Mines. These rose at one time to 6s. on American buying. The company's agreement with the British Government is of a complex nature and the value of these shares in the event of nationalization remains a doubtful factor.

Canadians were unsettled although Hollinger were again firm and International Nickel hardened on the news that a further 1,000,000 lbs. of nickel will be released by the American stockpile. The sharp fall in profits by Yukon Gold was partially offset by lower depreciation allowances and tax so that the net results were only slightly down. The company, of course, benefits from the Canadian gold subsidy arrangements.

| Finance | Price April 4 | + or — on week |
|---|---|---|
| African & European | 2 1/16 | |
| Anglo American Corpn. | 8 | —1/8 |
| Anglo-French | 19/- | —3d |
| Anglo Transvaal Consol | 28/1 1/2 | |
| Central Mining (£1 shrs) | 38/6 | —6d |
| Consolidated Goldfields | 56/6 | —3d |
| Consol. Mines Selection | 32/6 | |
| East Rand Consols. | 1/9 | +1 1/4d |
| General Mining | 4 1/4 | —1/8 |
| H.E. Prop. | 7/10 1/2 | —1 1/4d |
| Johnnies | 38/3 | +1/- |
| Rand Mines | 3 3/8 | |
| Rand Selection | 40/- | |
| Union Corporation | 38/3 | +6d |
| Vereeniging Estates | 4 3/8 | |
| Writs | 33/9 | —7 1/4d |
| West Wits | 38/3 | —3d |
| **Rand Gold** | | |
| Blyvoors | 24/- | —3d |
| Brakpan | 6/7 1/4 | +1 1/4d |
| Buffelsfontein | 26/6 | +3d |
| City Deep | 10/9 | +1/- |
| Consol. Main Reef | 18/9 | —7 1/4d |
| Crown | 2 1/8 | —1/8 |
| Daggas | 2 1/8 | —1/8 |
| Dominion Reefs | 19/9 | —6d |
| Doornfontein | 21/9 | —3d |
| Durban Deep | 28/1 1/2 | —1/3 |
| E. Champs | 4/- | |
| E. Daggas | 9/- | —3d |
| E. Geduld (4s. units) | 34/3 | |
| E. Rand Props. | 2 1/8 | —1/8 |
| Geduld | 4 1/8 | |
| Govt. Areas | 5/- | |
| Grootvlei | 20/9 | |
| Hartebeestfontein | 36/9 | +6d |
| Libanon | 7/1 1/2 | —1 1/4d |
| Luipaards Vlei | 15/6 | —3d |
| Marievale | 20/6 | —3d |
| New Kleinfontein | 5/- | |
| New Pioneer | 14/6 | |
| Randfontein | 46/9 | —6d |
| Robinson Deep | 13/9 | —6d |
| Rose Deep | 10/6 | +3d |
| Simmer & Jack | 4/- | |
| S.A. Lands | 20/7 1/2 | |
| Springs | 2/9 | +1 1/4d |
| Stilfontein | 25/3 | +6d |
| Sub Nigel | 31/3 | —7 1/4d |
| Vaal Reefs | 30/6 | |
| Van Dyk | 3/- | —1 1/4d |
| Venterspost | 13/3 | —3d |
| Vlakfontein | 16/6 | |
| Vogelstruisbult | 20/3 | +9d |
| West Driefontein | 5 1/8 | +1/8 |

| Rand Gold contd. | Price April 4 | + or — on week |
|---|---|---|
| W. Rand Consolidated | 38/1 1/2 | —7 1/4d |
| Western Reefs | 31/- | —3d |
| **O.F.S. Gold** | | |
| Freddies | 8/- | +4 1/4d |
| Freddies Consolidated | 4/3 | |
| F.S. Geduld | 4 | |
| Geoffries | 12/6 | +3d |
| Harmony | 25/3 | —3d |
| Loraine | 5/9 | +3d |
| Lydenburg Estates | 17/- | +3d |
| Merriespruit | 10/9 | +3d |
| Middle Wits | 12/9 | +4 1/4d |
| Ofsits | 56/9 | —3d |
| President Brand | 60/7 1/2 | |
| President Steyn | 31/- | —9d |
| St. Helena | 26/- | —3d |
| Virginia Ord. | 10/9 | +3d |
| Welkom | 21/6 | |
| Western Holdings | 3 1/2 | —1/8 |
| **West African Gold** | | |
| Amalgamated Banket | 1/9 | |
| Ariston | 5/- | —1 1/4d |
| Ashanti | 19/- | +1 1/4d |
| Bibiani | 3/3 | —1 1/4d |
| Bremang | 1/4 1/4 | |
| G.C. Main Reef | 2/1 1/2 | |
| Konongo | 2/- | +1 1/4d |
| Marlu | 1 1/2d | |
| Taquah | 1/4 1/2 | |
| Western Selection | 7/9 | |
| **Australian Gold** | | |
| Gold Mines of Kalgoorlie | 12/6XD | —6d |
| Great Boulder Prop. | 11/-XD | —3d |
| Lake View & Star | 16/6 | —1 1/4d |
| Mount Morgan | 22/9 | —4 1/4d |
| North Kalgurli | 7/3 | +1 1/4d |
| Sons of Gwalia | 3/- | +1 1/4d |
| Western Mining | 9/10 1/2 | —1 1/4d |
| **Miscellaneous Gold** | | |
| Cam & Motor | 8/9 | |
| Champion Reef | 4/3 | |
| Falcon Mines | 7/4 1/2 | |
| Globe & Phoenix | 25/9 | |
| Motapa | 1/3 | +1 1/4d |
| Mysore | 2/4 1/2 | +1 1/4d |
| Nundydroog | 6/6 | +3d |
| St. John d'El Rey | 19/3 | +3d |
| Zams | 56/3 | —1/10 1/2 |

| Diamonds and Platinum | Price April 4 | + or — on week |
|---|---|---|
| Anglo American Inv. | 8 1/4 | —1/4 |
| Casts | 23/6 | —6d |
| Cons. Diam. of S.W.A. | 8 | |
| De Beers Defd. Bearer | 5 1/2 | —1/4 |
| De Beers Pfd. Bearer | 15 1/2 | —1/2 |
| Pots Platinum | 12/7 1/2 | +7 1/4d |
| Waterval | 19/6 | +6d |
| **Copper** | | |
| Bancroft | 45/9 | +4/3 |
| Chartered | 76/6 | |
| Esperanza | 3/7 1/4 | —1 1/4d |
| Messina | 10 1/4 | |
| Nchanga | 15 1/2 | —1/2 |
| Rhod-Anglo-American | 5 1/8 | —1/4 |
| Rhod-Katanga | 29/10 1/2 | +4 1/4d |
| Rhodesian Selection | 54/6 | —3d |
| Rhokana | 42 1/2 | —1/2 |
| Rio Tinto | 3 1/8 | —1/8 |
| Roan Antelope | 29/7 1/2 | —4 1/4d |
| Selection Trust | 4 1/2 | +1/8 |
| Tanks | 8 1/8 | —1/4 |
| Tharsis Sulphur Br. | 4 1/4 | |
| **Tin (Eastern)** | | |
| Ayer Hitam | 21/-XD | —9d |
| Gopeng | 9/3 | —1 1/4d |
| Hongkong | 7/- | —1 1/4d |
| Ipoh | 23/- | |
| Kamunting | 9/3 | —3d |
| Kepong Dredging | 2/9 | |
| Kinta Tin Mines | 18/-XD | |
| Malayan Dredging | 9/9 | —1 1/4d |
| Pahang | 12/6 | +1 1/4d |
| Pengkalen | 11/4 1/2 | +4 1/4d |
| Petaling | 8/6 | —1 1/4d |
| Rambutan | 24/3XD | —9d |
| Siamese Tin | 8/6 | —6d |
| Southern Kinta | 15/9 | +1 1/4d |
| S. Malayan | 8/- | —3d |
| S. Tronoh | 7/- | —1 1/4d |
| Sungei Kinta | 15/6 | |
| Tekka Taiping | 8/6 | —1 1/4d |
| Tronoh | 8/9XD | —6d |
| **Tin (Nigerian and Miscellaneous)** | | |
| Amalgamated Tin | 11/- | —1 1/4d |
| Beralt Tin | 38/9 | +3d |
| Bisichi | 5/9 | —1 1/4d |
| British Tin Inv. | 21/9 | —9d |
| Ex-Lands Nigeria | 2/7 1/2 | |
| Geevor Tin | 15/7 1/2 | +3d |

| Tin (Nigerian and Miscellaneous) contd. | Price April 4 | + or — on week |
|---|---|---|
| Gold & Base Metal | 1/6 | |
| Jantar Nigeria | 5/6 | —1 1/2d |
| Jos Tin Area | 12/3 | |
| Kaduna Prospectors | 1/6 | —3d |
| Kaduna Syndicate | 2/7 1/2 | |
| London Tin | 9/7 1/2 | |
| United Tin | 1/7 1/2 | |
| **Silver, Lead, Zinc** | | |
| Broken Hill South | 60/- | +6d |
| Burma Corporation | 5/9XD | +1/10 1/2 |
| Consol. Zinc | 53/6 | |
| Lake George | 14/9 | +3d |
| Mount Isa | 21/3 | +1 1/4d |
| New Broken Hill | 44/9 | —6d |
| North Broken Hill | 4 1/2 | |
| Rhodesian Broken Hill | 12/- | —1 1/4d |
| San Francisco Mines | 25/9 | |
| Uruwira | 5/4 1/2 | |
| **Miscellaneous Base Metals and Coal** | | |
| Amal. Collieries of S.A. | 49/- | —3d |
| Associated Manganese | 38/9 | |
| Cape Asbestos | 9/4 1/2 | —1 1/2d |
| C.P. Manganese | 31/3 | |
| Consol. Murchison | 63/1 1/2 | |
| Natal Navigation | 3 1/8 | —1/4 |
| Turner & Newall | 102/6 | +2/- |
| Wankie | 16/7 1/2 | |
| Witbank Colliery | 5 | +1/4 |
| **Canadian Mines** | | |
| Dome | $25 1/2XD | —2 1/2 |
| Hollinger | $50 | +1 |
| Hudson Bay Mining | $125 | —2 |
| International Nickel | $169 | +1 |
| Mining Corpn. of Canada | £10 1/4 | —1/4 |
| Noranda | $111 | —3 1/2 |
| Quemont | £10 4 1/2 | —1/4 |
| Yukon | 4/4 1/2 | —3d |
| **Oil** | | |
| Apex | 31/9 | +3d |
| Attock | 41/6 | +1/- |
| British Petroleum | 5 1/2 | +1/4 |
| Burmah | 3 3/4 | +1/8 |
| Canadian Eagle | 57/- | +6d |
| Mexican Eagle | 21/3 | —3d |
| Shell | 7 1/2 | +1/4 |
| Trinidad Leasehold | 35/9 | —9d |
| T.P.D. | 36/9 | +9d |
| Ultramar | 35/9 | —1/- |

# COMPANY NEWS AND VIEWS

## Rho-Kats' and Rio Tinto's Exploration Agreement

Detailed in the annual report and accounts of Rhodesia-Katanga are the terms of an agreement which has been reached between the company and Rio Tinto for the exploration of some 2,500 sq. miles in Northern Rhodesia, over which coal and mineral rights are held. The company's rights are subject to a 15 per cent interest held by the British South Africa Company.

Rio Tinto Finance and Exploration will be appointed consulting engineers to Rhodesia-Katanga for a period of five years, or such time as the programme may take to complete. Contributions towards the cost of exploration, which may amount to approximately £150,000 over three years, will be made as to 33.33 per cent by Rio Tinto Finance, and 7.5 per cent by Chartered. In the event of discoveries of sufficient importance to warrant the flotation of a mining company, the vendors' consideration would be allotted to absorb the cost of exploration up to that point, as to 59.17 per cent to Rho-Kats; 33.33 per cent to Rio Tinto Finance, and 7.5 per cent to Chartered.

Subscription rights in such a mining company, would, however, be allotted as to 42.5 per cent to Rho-Kats, 50 per cent to Rio Tinto Finance, and 7.5 per cent to Chartered.

The mining company would, of course, be subject to the current rate of mineral royalty, which would be collected by Chartered for a fee of 10 per cent. The balance of 90 per cent would be divided as to 85 per cent to Rho-Kats and 15 per cent to Chartered. Rho-Kats would then pass on one-third of their share of the royalty to Rio Tinto Finance. Distribution would therefore be 51 per cent of Rho-Kats, 25.5 per cent to Rio Tinto Finance, and 23.5 per cent to Chartered.

It is most encouraging to hear that recent rumours concerning the possibility of an agreement between Rho-Kats and Rio Tinto have in the event resulted in such a favourable conclusion. From Rho-Kats' point of view the services of a widely known and most successful organization have been obtained without having to incur more than 60 per cent of exploration cost. Moreover, the fact that Rho-Kats would retain rights to nearly 60 per cent of vendors' consideration and 51 per cent of royalty receipts is most satisfactory. On the other hand, although it has undertaken to bear so large a proportion of exploration costs, Rio Tinto has made sure of the future by obtaining 50 per cent of the potentially most valuable subscription rights.

Development at the Kansanshi Copper Mining Company has, the report states, indicated the reasonable possibility of proving sufficient sulphide ore of a mill grade of about 3.5 per cent copper to give the mine a life of at least eight years. But it should be remembered that development has recently produced good results and this figure could prove to be conservative. It was also encouraging to read that the target date for milling at Kansanshi has been brought forward to the last quarter of 1956 and, it seems possible that a further improvement on this date might be achieved.

## Tanks Maintains 15 Per Cent Interim

With the declaration of 15 per cent on its issued ordinary capital of £3,831,412 in ordinary stock units of 10s., Tanganyika Concessions has maintained its interim dividend in respect of the year ending July 31, 1956, at the same level as that of the previous year. The 1954-55 interim was followed by a final of 55 per cent making a total of 70 per cent.

## March Rand Returns Show Good Features

Notable amongst returns from South African Rand and O.F.S. gold and uranium mines in respect of March were rises in working profits at President Brand from £350,027 in February to £355,070; at Doornfontein from £80,375 to £88,294; at West Drie from £494,031 to £518,111; and at Blyvoor from £404,060 to £423,862. Returns were based on a gold price of 248s. 11d. per oz. against 248s. 9d. for the preceding month.

With an initial profit of £50,048 from gold and uranium Merriespruit has made an impressive entry into the list of O.F.S. producers. Indeed, at 75,000 tons, its maiden mill throughput constituted a record.

The crushing rate at Free State Geduld rose to 36,500 tons from 35,000 tons during February. Costs dropped to 68s. 1d. from 69s. 7d., and working profits improved to £31,746 from £25,006. Although much has been written about this mine in recent months, it is now almost four years since its two shafts intersected reef. It is, therefore, interesting at this point to summarize past information which has a bearing on the rich southern section of the mine.

The No. 1 shaft was sunk close to a borehole which assayed 1,084 in. dwt., and some 2,000 ft. to the east of borehole Mijannie No. 1 which assayed 1,747 in. dwt. But the subsequent shaft intersection of reef took place in a faulted zone and the small amount of shattered reef which was sampled assayed only 189 in. dwt. As at December 31, 1955, a total of 9,845 ft. had been sampled in No. 1 shaft area, of which 89.5 per cent was payable, averaging 589 in. dwt. Moreover, the bulk of this development was to the north-east of the shaft where good values had not been expected.

While only limited development indications have as yet been obtained from this apparently rich area the results have been most encouraging. Roughly speaking the work involved has taken place on or to the south of a line running from east to west through the shaft. Values have included 1,081 in. dwt. obtained from an underground borehole 450 ft. west of the shaft. In addition, 80 ft. of development in the shaft vicinity yielded 1,226 in. dwt., while a further underground borehole 2,000 ft. south of the shaft and 1,000 ft. east of borehole Mijannie No. 1 gave 6,461 in. dwt.

The No. 2 shaft was sunk close to a borehole which assayed 227 in. dwt. from a poor core recovery. The shaft intersection of reef later assayed 635 in. dwt. At December 31, 1955, 1,935 ft. had been sampled of which 98 per cent was payable, averaging 903 in. dwt. About half of this reef development lies to the north of the line of the crosscuts to reef running roughly east-west. Yet it was to the south of this line that high values were expected and average reef development has, therefore, been considerably better than anticipated.

Four of the levels being driven from No. 2 shaft have now intersected reef at comparatively widely spaced intervals.

| | | |
|---|---|---|
| 51 Level | 35 ft. sampled, averaged | 2,304 in. dwt. |
| 47 Level | 20 ft. sampled, averaged | 1,881 in. dwt. |
| 45 Level | 10 ft. sampled, averaged | 1,672 in. dwt. |
| 43 Level | 55 ft. sampled, averaged | 1,617 in. dwt. |

In the 41 Haulage north from Western Holdings, more than 4,000 ft. to the south of these disclosures, 1,150 ft. has been sampled on the Free State Geduld side of the boundary. This averaged 1,867 in. dwt.

About 1,500 ft. to the north-west of this development lies borehole Geduld No. 1, which assayed 23,037 in. dwt. About 2,500 ft. to the east borehole, Geduld No. 2 gave an assay of 12,528 in. dwt. Moreover, to the south of the joint boundary with Western Holdings, several very rich intersections of reef have been made.

In the light of the limited but significant information available regarding the southern section of the mine it will indeed be surprising if outstanding results are not soon forthcoming. If a line is drawn through the two shafts, it will be found that the reef has been intersected in development or boreholes to the south of this line in no less than 10 separate instances. In every case the assay has exceeded 1,000 in. dwt.

Needless to say it seems highly improbable that three separate and widely spaced boreholes should each have given an assay of over 6,000 in. dwt. unless there were considerable stretches of reef averaging upwards of 5,000 in. dwt.

## City Deep Sells 260 Acres

City Deep, Ltd., has announced that subject to shareholders' approval it has agreed to sell approximately 260 acres of freehold land on the Farms Klipriviersberg No. 25 and Doornfontein No. 24 to the Johannesburg City Council for the sum of approximately £360,000. It is understood that the Council has agreed to make the purchase subject to the Administrator granting his consent.

## St. Helena's No. 2 Shaft Borehole

An interesting section of the consulting engineer's report for St. Helena Gold Mines in respect of the financial year ended December 31, 1955, concerned a borehole which is being drilled adjacent to the No. 2 shaft. While the primary object of this operation is to seal off by cementation any water-bearing fissures in the path of the shaft, some interesting values have been disclosed from intersections of the Basal and Leader reefs. At a depth of 4,071 ft. values from the Basal reef assayed

8.1 dwt. over 3.7 in. equal to 30 in. dwt. A deflection made to bring the hole nearer to the centre of the shaft also intersected this reef assaying 1.8 dwt. over 5.2 in. equivalent to 9 in. dwt. The Leader reef was intersected at 4,030 ft. and assayed 1.05 dwt. over 17.1 in. equal to 18 in. dwt. The A and B reefs were not recognized in the hole.

### Sharp Increase in Frontino's Ore Reserves

During the year ended December 31, 1955, Frontino Gold Mines achieved a substantial increase in ore reserves to 346,188 tons at a value of 18.2 dwt. per ton from 212,845 tons at 18.6 dwt. previously. Although audited returns from Colombia have not yet been received, it is expected that the accounts for twelve months ended December 31, 1955, will show profits, subject to income tax, in excess of £210,000.

### Anglo-French Reduces Gold Holdings

In his statement to shareholders in Anglo-French Exploration, Mr. F. R. Cottell, the chairman, gave the company's usual percentage classification of investments based on valuation at December 31, 1955. From these statistics it is evident that the swing away from gold investments has continued during the past financial year. Holdings in this industry now represent 52.7 per cent of the portfolio compared with 54.9 per cent in 1954. Similarly, the company's participation in oil and base metals has again increased. Funds invested in oil moved up to 18.8 per cent from 17.6 per cent, while those in copper, lead and zinc advanced to 13.6 per cent from 12.7 per cent. On the other hand tin investments which in 1954 amounted to 6.7 per cent have fallen to 3.9 per cent. While a new category, platinum, introduced during the past year represents 2.5 per cent.

Referring to Anglo-French's investments in gold mining—which are mainly concerned with properties in the Far West Rand and O.F.S., Mr. Cottell reminded shareholders that most of these companies had either reached or will shortly reach the dividend paying stage. Moreover, they were still in the process of extending operations which should have favourable effects on future profits and dividends.

### British Aluminium Earns More : Pays Same

After higher provisions for depreciation and plant replacement, group manufacturing and trading profits of the British Aluminium Company during the year ended December 31, 1955, expanded sharply to £3,250,000 from just under £2,000,000 for 1954. After taxation of £1,800,000 (£1,200,000) and minority interests, profit balance attributable to the company was almost doubled at £1,400,000 against £720,151. With the recommendation of a final dividend of 8 per cent the previous year's distribution of 12 per cent on the £5,000,000 ordinary stock has been maintained. Lord Portal of Hungerford is chairman. Meeting, May 8.

### United British Pays 2½ Per Cent More

With the recommendation of a dividend amounting to 15 per cent tax free on its £1,500,000 ordinary capital, United British Oilfields of Trinidad has increased its distribution for the year ended December 31, 1955, by 2½ per cent, tax free, from 12½ per cent, tax free, previously. Mainly due to increases in crude production and refinery throughput, net profit, subject to audit, rose to £1,345,815 from £983,800. Provision for U.K. and Trinidad taxation was £1,016,098 (£703,000). Expenditure on capital assets totalled £744,000 and compared with £1,350,000.

It is announced that permission to transfer the company's control and management to Trinidad is being sought from H.M. Treasury. Since all operations are based on Trinidad such an arrangement would, it is thought, be more appropriate.

### Kinta to Make Tax-Free Cash Distribution

Besides confirming its intention to make a repayment of capital amounting to 2s. per share, The Kinta Tin Mines also proposes to make a cash distribution equivalent to 7½d. a share tax-free. This has been made possible by the impending receipt of a dividend totalling £15,513 from Tanjong Tin Dredging. An extraordinary meeting to consider this proposal, which involves a total of £15,000, will be held on April 12.

### Camp Bird Meeting Date

The annual general meeting of Camp Bird Ltd. will be held on May 10 instead of May 9 as previously announced.

# Obituary

### MR. FREDERICK RAU

We regret to announce the death of Mr. Frederick Rau on March 27, following a heart attack. Though only in his fiftieth year, Mr. Rau had been a director of Derby and Co., Ltd., since 1929, and was prominently associated with the expansionist policy of this firm. A man of outstanding personality, he was well known to a very wide section of the metal and mineral trades throughout the world.

# Gold Mine Returns

### SOUTHERN RHODESIAN GOLD

| Company | February, 1956 | | | Months since year end | Current Financial Year Total to date | | | Last Financial Year Total to date | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tons (000) | Yield (oz.) | Profit (£000) | | Tons (000) | Yield (oz.) | Profit (£000) | Tons (000) | Yield (oz.) | Profit (£000) |
| Arcturus | 3.2 | 1,313 | 5·2 | 8 | 24·6 | 9,179 | 39·4 | 24·4 | 7204 | 23·7 |
| Cam & Motor | 23·5 | 7,955 | 39·7 | 8 | 187·5 | 61,491 | 314·2 | 192·3 | 60,340 | 330·5 |
| Falcon Mines | 19·7 | 3,507 | a10·3 | 5 | 94·0 | 16,708 | 48·4 | 85·1 | 15,567 | 58·2 |
| Globe & Phoenix | 6·1 | 3,660 | 23·1 | 2 | 12·3 | 7,329 | 46·3 | 12·2 | 7,084 | 47·5 |
| Motapa Gold* | 17·0 | 2,439 | 2·7 | 2 | 33·8 | 5,429 | 5·6 | 30·2 | 4,205 | L0·1 |
| Muriel Mine | 3·1 | 966 | 10·2 | 8 | 26·4 | 8,373 | 81·4 | 25·2 | 7,877 | 80·5 |
| Tebekwe | 4·0 | 717 | 2·5 | 8 | 43·7 | 7,424 | 25·5 | 65·3 | — | 20·9 |

* Excluding premium gold sales
L indicates a loss
*a* This figure includes additional profit from accumulated concentrates retreated from all three mines

### AUSTRALIAN GOLD

| Company | 4 weeks to February 21 1956 | | 4 weekly period since year-end | Current Financial Year Total to date | | Last Financial Year Total to date | |
|---|---|---|---|---|---|---|---|
| | Tons (000) | Yield (oz.) | | Tons (000) | Yield (oz.) | Tons (000) | Yield (oz.) |
| Central Norseman | 12·4 | 5,793 | 12 | 158·3 | 87,107 | 145·5 | 75,120 |
| Central Victoria* | 96·1 | 484*a* | 12 | 1,050·7 | 4,372 | 1668·4 | 5,225 |
| G.M's. of Kalgoorlie | 36·7 | 10,220 | 12 | 453·8 | 117,621 | 206·6 | 56,702 |
| Great Western | 38·8 | 5,943 | 12 | 412·6 | 59,682 | 390·0 | 52,098 |
| Morning Star | 0·7 | 430 | 12 | 14·6 | 4,717 | 15·4 | 9,875 |
| North Kalgurli | 28·1 | 5,346 | 2 | 55·8 | 11,207 | 43·7 | 10,073 |
| Sons of Gwalia | 6·3 | 2,024*b* | 2 | 6·3 | 2,024 | 18·3 | 3,176 |

* Cu. yd. dredged
*a* Dredge closed one day statutory holiday
*b* No production Dec. 6 till end January owing to broken main shaft

### INDIAN GOLD

| Company | February 1956 | | Months since year-end | Current Financial Year Total to date | | Last Financial Year Total to date | |
|---|---|---|---|---|---|---|---|
| | Tons (000) | Yield (oz.) | | Tons (000) | Yield (oz.) | Tons (000) | Yield (oz.) |
| Champion Reef | 15·3 | 5,310 | 2 | 31·0 | 10,645 | 28·7 | 10,712 |
| Mysore | 18·3 | 4,949 | 2 | 36·5 | 10,332 | 31·5 | 9,487 |
| Nundydroog* | 15·1 | 4,162 | 2 | 34·0 | 8,661 | 35·4 | 8,763 |

* Includes tailings

### MISCELLANEOUS GOLD

| Company | February 1956 | | Months since year-end | Current Financial Year Total to date | | Last Financial Year Total to date | |
|---|---|---|---|---|---|---|---|
| | Tons (000) | Yield (oz.) | | Tons (000) | Yield (oz.) | Tons (000) | Yield (oz.) |
| British Guiana | 180·1 | 994 | 2 | 339·3 | 2,234 | 281·9 | 3,308 |
| Clutha River* | 230 | 324 | 12 | 2887·0 | 5,206 | 2412·0 | 4,738 |
| Frontino | 11·5 | 6,439 | 2 | 22·6 | 17,169 | 23·2 | 12,062 |
| Kentan (Geita) | 21·4 | 3,360 | 8 | 177·9 | 26,970 | 179·3 | 27,466 |
| New Gu. G'fields | 3·6 | 1,487 | 5 | 17·6 | 8,825 | 17·5 | 7,130 |
| St. John d'El Rey | 29·6 | 124 | 2 | 56·3 | 239 | 52·7 | 223·5 |

* Cu. yd. dredged

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# ANGLO-FRENCH EXPLORATION

## INCREASED PROFITS

The Sixty-sixth Annual General Meeting of The Anglo-French Exploration Company, Limited, was held on March 28 in London.

The Chairman, **Mr. F. R. Cottell, A.C.A.,** in the course of his speech said :

The issued capital is £900,000, the increase of £100,000 arising from the offer to stockholders of 100,000 shares of £1 each at par in June 1955, which I am pleased to say was fully subscribed. General reserve is increased to £110,000 by the transfer of £10,000 from taxation provisions which are no longer required.

### INVESTMENTS

Our investments stand in the books at £1,119,348 and are valued at £1,488,903, an excess of £369,000. By reason of our investment in New Consolidated, Free State, Exploration Co., Ltd., we were entitled during 1955 to subscribe for shares in Free State Saaiplaas Gold Mining Co., Ltd., which right was exercised, thus giving us a valuable interest in the most recent public flotation in the Orange Free State. We have a small participation in a gold prospect in respect of which a comprehensive drilling programme is being carried out by Johannesburg Consolidated Investment Co., Ltd., over three farms, Modderfontein No. 4, Waterpan 45 and Jachtfontein 99 lying to the south of the Randfontein mine and to the east of the Libanon mine.

The classification of our investments based on the valuation at December 31, 1955, is :—

| | |
|---|---|
| Gold mining (including holding companies which have substantial interests in gold mining companies) | 52.7% |
| Oil | 18.8% |
| Copper, lead, zinc | 13.6% |
| Coal | 7.4% |
| Tin | 3.9% |
| Platinum | 2.5% |
| Miscellaneous | 1.1% |

As in the past our preponderant interest continues to be in gold mining and the gold mining companies in which our funds are at present invested are mainly located in the Far West Rand and in the Orange Free State in the Union of South Africa. Most of these companies have now reached, or will shortly reach, the dividend paying stage but are still in the process of extending the scale of their operations which, it is anticipated, should have favourable effects on their future profits and dividends.

### PROFIT AND LOSS ACCOUNT

The profit and loss account shows that there has been a welcome increase in our dividend income while profit realized by sales and sundry credits also shows an improvement, total revenue amounting to £137,277 against £104,688 last year. The profit for the year is £45,509 against £39,109 in 1954 and the dividend which we recommend of 8½% on the increased capital will require £45,281.

A number of mining prospects which were offered to the Company in the course of the year were investigated but none of them proved sufficiently promising for business to result.

During the year I paid a visit to the Company's office in Johannesburg and while there I discussed the prospects of, and also took the opportunity of inspecting, our main interests in Africa.

The recent South African budget statement reveals that the basis for taxing the profits of gold mining is to revert to the formula which was in operation prior to 1951. It is estimated that this will represent a saving to the industry of approximately £700,000 annually. While this saving is small in relation to the industry's total tax bill it must be welcomed as at least a step in the desired direction.

During the year 1955 the total production of gold in the Transvaal and Orange Free State amounted to 14,602,000 ozs. compared with 13,227,000 ozs. in the previous year.

At the end of 1955 sixteen mines in the Transvaal and Orange Free State were producing uranium compared with only eight mines a year earlier. Thus it will be appreciated that uranium is becoming of increasingly material importance to the South African gold mining industry.

The report and accounts were adopted.

# CENTRAL MINING—RAND MINES GROUP

**NOTICE IS HEREBY GIVEN THAT THE ORDINARY GENERAL MEETINGS OF THE UNDERMENTIONED COMPANIES WILL BE HELD IN THE BOARD ROOM, SECOND FLOOR, THE CORNER HOUSE, COMMISSIONER STREET, JOHANNESBURG, AS FOLLOWS :—**

| *Name of Company (each Incorporated in the Union of South Africa)* | *Date of Meeting* 1956 | *Time* | *Transfer Books and Register of Members will be closed from (both days inclusive)* 1956 |
|---|---|---|---|
| Modderfontein B. Gold Mines Limited | Monday 7th May | 11 a.m. | 1st to 7th May |
| Durban Roodepoort Deep Limited | do. | Noon | do. |
| Rose Deep Limited | do. | 2.30 p.m. | do. |
| Geldenhuis Deep Limited | do. | 3.30 p.m. | do. |
| Crown Mines Limited | Tuesday 8th May | 11 a.m. | 2nd to 8th May |
| East Rand Proprietary Mines Limited | do. | Noon | do. |
| City Deep Limited | do. | 2.30 p.m. | do. |
| Transvaal Consolidated Land and Exploration Company Limited | do. | 3.30 p.m. | do. |
| Rand Mines Limited | Friday 11th May | 11 a.m. | 5th to 11th May |

### ITEMS OF SPECIAL BUSINESS TO BE TRANSACTED AT THE ORDINARY GENERAL MEETINGS

1. Except in the cases of Geldenhuis Deep, Limited, Transvaal Consolidated Land and Exploration Company, Limited and Rand Mines, Limited, members of the respective Companies will be asked to consider the passing of a special resolution to dispense with the necessity of placing before annual general meetings the return specifying the contracts referred to in Sub-section (9) of Section 70 quin. of the Companies Act, 1926, of the Union of South Africa, as amended.
2. At each of the above mentioned Ordinary General Meetings, members will be asked to consider the passing of a special resolution to amend the Articles of Association to permit the use of mechanical signatures on share certificates, etc.
3. In the cases of Modderfontein B. Gold Mines, Limited and Rose Deep, Limited, members will be asked to consider the passing of a special resolution to reduce the authorised capital of these two Companies.

The Notices of Meetings which accompany the respective Directors' Reports of the above mentioned Companies for the year ended 31st December, 1955, include the texts of the proposed resolutions ; and the reasons for the passing of these resolutions are set out in the Directors' Reports.

### GENERAL NOTE

A member entitled to attend and vote at a meeting may appoint one or more proxies to attend and vote and speak in his stead. A proxy need not be a member of the Company.

In the case of Rand Mines, Limited, a proxy may vote only on a poll.

Those holders of Share Warrants who wish, and have the right to be represented at these meetings, can obtain the necessary information regarding the formalities to be complied with on application.

BY ORDER OF THE BOARDS,
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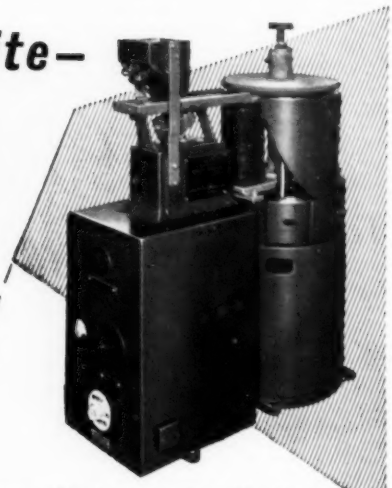

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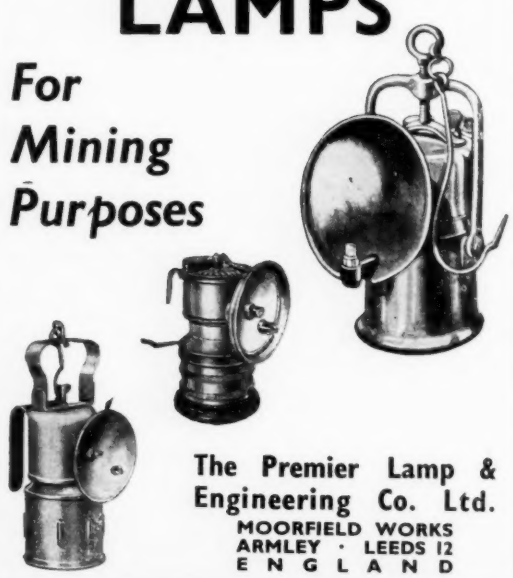

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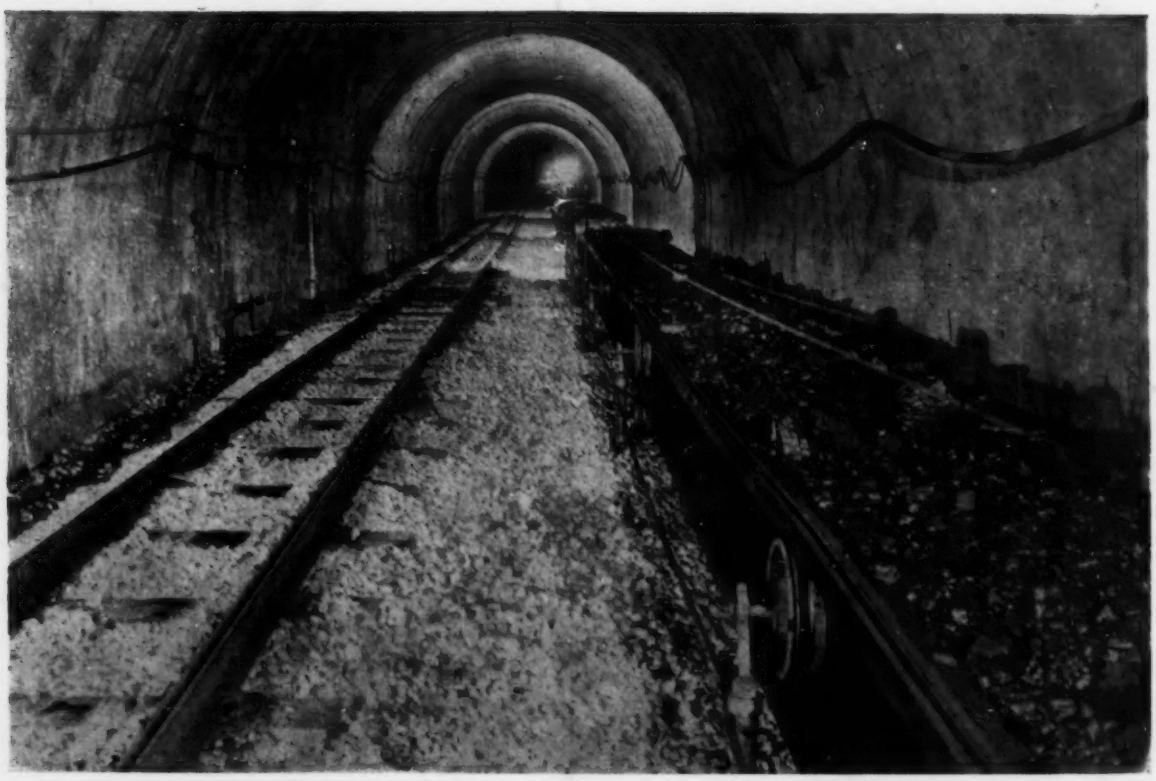

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